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April 2014
Issue 401

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Future Publishing Australia,
PO Box 1077, Mount Street, North Sydney, NSW 2059
Tel: 02 9955 2677 Fax: 02 9955 2688
Email: apcmag@futurenet.com
Web: www.apcmag.com

EDITORIAL

Editor Dan Gardiner
Managing Editor Melanie Pike
Features/Disc Editor Peter Dockrill

ART/PRODUCTION

Art Director Troy Coleman
Senior Designer Sally Ryan
Senior Designer Nykke Coleman

CONTRIBUTORS

Helen Bradley, Nathan Brown, Richard Cobbett, Phil Iwaniuk, Dave James, Jeremy Laird, Tom McNamara, David Murphy, Josh Norem, Steve Paris, Nick Peers, Matthew JC Powell, Mayank Sharma, Nathan Taylor, Jimmy Thang, Chris Thursten, Luis Villazon, Mike Williams, Darren Yates

SENIOR MANAGEMENT

Chief Operating Officer Neville Daniels

COMMERCIAL

Commercial Director Dave Cox
dave.cox@futurenet.com
Sales Director Paul Marttila
paul.marttila@futurenet.com
Sales Executive Thomas Klingler
thomas.klingler@futurenet.com

ABOUT THE MAGAZINE

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Can privacy be saved?

APC's editor asks if privacy is the necessary price of living in the digital age.

If you care about privacy, the last year has essentially been one long, uninterrupted nightmare. With the latest revelations seeming to indicate that the NSA had effectively implemented its own bonnet under the TURBINE program, it doesn't seem like the disturbing news is going to ebb anytime soon.

Our privacy has been compromised largely because of an unhappy collision of corporate strategy (collecting information on users of its services) and governmental spying (going after that data). While we should be suspect of both, corporate goals are at least transparent – the bottom line is that they're out to make money. Governmental surveillance is a little more nebulous and has potentially more severe individual ramifications – potentially leading to imprisonment or, in some countries, execution. In a sense, it's in a corporation's best interests to keep our data private – to keep us happy, and ensures our data remains a rare and valuable commodity with economic value.

What we individuals primarily need protection from, then, is unwarranted governmental access to information held by corporations. So how do we go about ensuring it?

Is an internet bill of rights the answer? Web founder Tim Berners-Lee recently pitched this idea, inviting web users to draft a constitution of web rights. But would a bill of rights really make any difference? After all, rights are often waived or just ignored in times of war – and in this terrorism-gripped era, "time of war" now has a much broader definition. What's to stop governments ignoring the bill? We may just need to accept that

ubiquitous electronic surveillance is here to stay – although that in itself might be redeemable via a system of co-surveillance, where the watchers are monitored just as closely to ensure no misuse or abuse takes place. Kevin Kelly, co-founder of *Wired* magazine, wrote a detailed piece on this topic recently (tinyurl.com/nty5w3v). While the idea sounds great on paper – and if corporations and governments were the only ones interested in getting hold of our information then it might work. But with cybercrime on the rise, we still need to protect our privacy against would-be thieves.

As long as the data is out there for the taking, only protected by limited security then governments will likely find the temptation to harvest that data too strong to ignore. NSA-contractor turned whistleblower Edward Snowden has suggested that we need end-to-end encryption of data across the web – which would help eliminate weak points that could be targeted for spying – which, to me, seems like it's the most prudent solution, and one that can potentially help protect against criminal activity too.

Ultimately, it'll likely be a combo of all of the above that works best: encrypt as much as we can, make governments accept that internet users have rights, and – most importantly – keep a close eye on those governmental agencies that are allowed to access our data.



DAN GARDINER
EDITOR
dan.gardiner@futurenet.com

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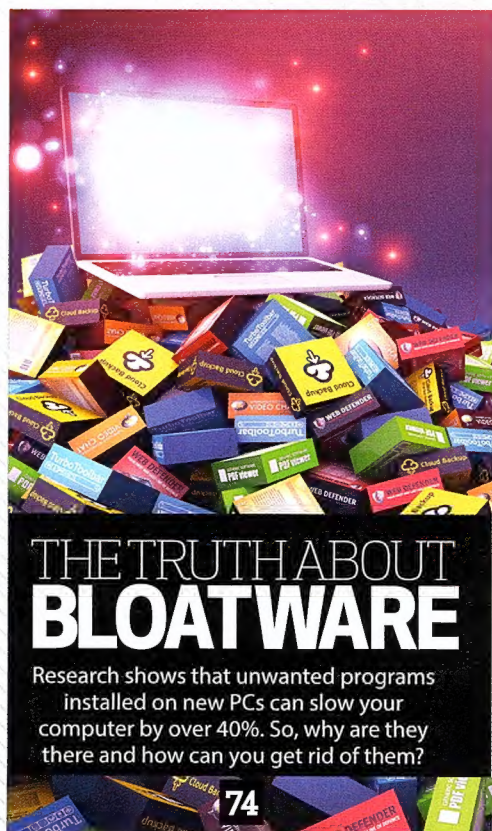
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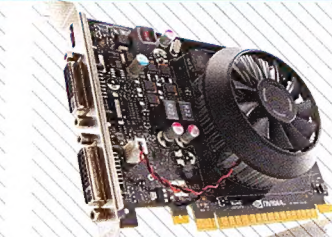
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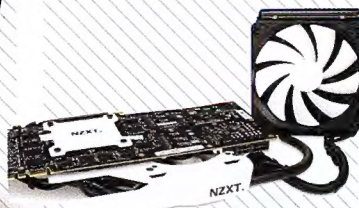
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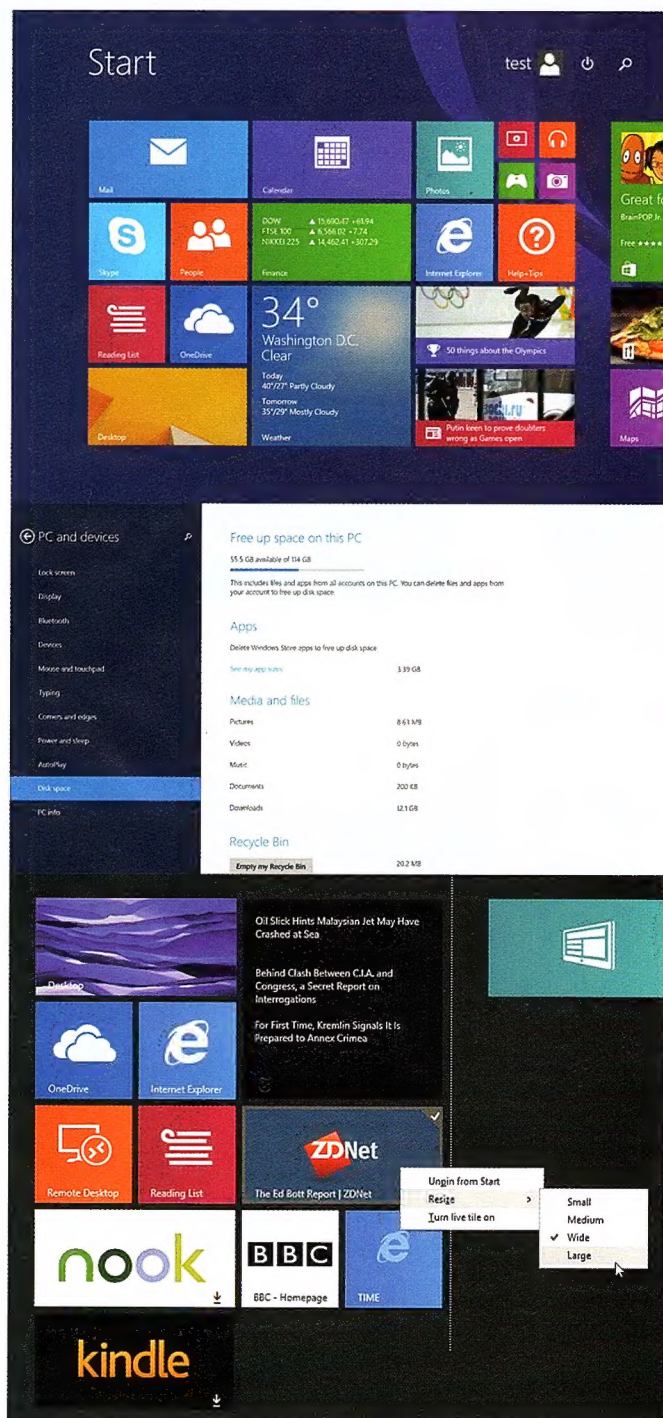
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technotes

» NEED TO KNOW



Windows 8.1 Update 1 is go

By the time you read this, Microsoft's latest Windows update will be hitting the servers, says Peter Dockrill.

It's time to hit the update button again, folks. Microsoft is expected to be making its latest Windows update – officially dubbed Windows 8.1 Update 1 – available shortly after this issue of APC hits the newsstands. 'Windows 8.1 Update 1' might not sound like a radical upgrade, but it's still a significant feature makeover for 8.1 users (with only one other scheduled patch, presumably titled Update 2, expected later in the year).

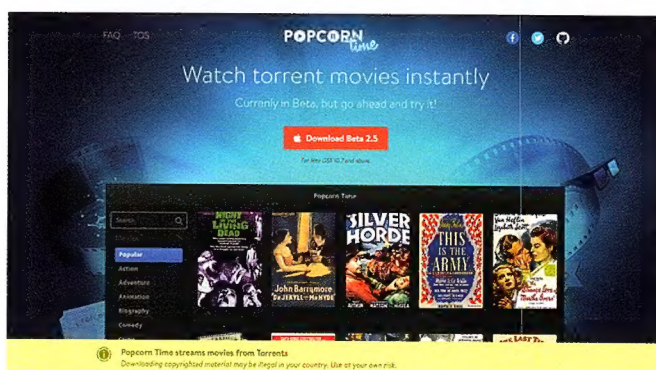
In deference to traditional Windows desktop users – as opposed to Microsoft's concerted emphasis in recent times on touchscreen and hybrid devices – Windows 8.1 Update 1 is designed to tweak the operating system for the benefit of keyboard and mouse users (what a radical notion!). This includes numerous enhancements to the desktop taskbar – which now houses Modern/Metro apps in addition to desktop programs – plus new prominent search and shutdown buttons on the start screen. The system footprint is also reduced, enabling PCs with only 1GB RAM and 16GB storage to run the OS – though this is likely to benefit buyers of new low-end devices rather than current users.

In addition to the new update, rumours suggest Microsoft is also planning to release a separate, free version of Windows 8.1 to boost user uptake (which hasn't exactly been booming so far). 'Windows 8.1 with Bing' is said to be an experimental build that comes bundled with a number of Microsoft apps built in, chiefly designed to lure Windows stragglers into the fold – namely PC users who have thus far stuck with Windows XP and 7, which between them still account for several times more installations globally than Microsoft's divisive Windows 8/8.1 platform. ■

Windows 8.1 Update 1 might not look all that different at a glance, but a number of contextual UI enhancements should please traditional keyboard and mouse users (which is most of you, going off the emails we receive).

Dodgy flicks: now on demand

Streaming media has taken off in the past couple of years, with on-demand music, TV and movies services changing the face of the legitimate entertainment industry, and now it seems the same revolution may be about to take place in its illegitimate counterpart. 'Popcorn Time' is a new BitTorrent-powered streaming service that lets users stream torrent movies to their PCs in real time. Currently in beta, the Popcorn Time client is available for Windows, Mac and Linux, offering a service that torrent news site TorrentFreak summed up as "Netflix for pirates, allowing users to stream the latest blockbusters at no cost." On the issue of illegality, Popcorn Time's FAQ helpfully clarifies: "Is this legal? Depends on where you're from, really." Uh... right. ■



Basic protection for the digital world

NSA whistleblower Edward Snowden might have transitioned into a global pop culture icon — a fact made clear by the arrival of his new unofficial action figure (that's him on the right, pictured alongside another famous now-plastic leaker) — but at a recent appearance at US tech and culture festival SXSW, Snowden only had serious things to say to those watching. The fugitive, who appeared via a heavily encrypted video chat from Russia using Google Hangouts, argued that only thorough end-to-end encryption would protect users' privacy from attackers and intelligence agencies, and called for broad civic oversight of the spying conducted by governments: "The bottom line [is] that encryption does work. We need to think of encryption not as this sort of arcane, black art... [but as] basic protection. It's the defence against the dark arts." ■



Hitching a ride to gaming nostalgia

Long-standing APC readers will recall a time when computer games featured blocks of descriptive text instead of high-res 3D graphics. Amongst the adventure game makers of the day, Infocom was the most celebrated (and prolific). The company's famous adaptation of Douglas Adams' *The Hitchhiker's Guide to the Galaxy* is now 30 years old, and to celebrate the anniversary the BBC has made the complete game playable on its web site via the wonders of HTML 5 (tinyurl.com/n8py97j). Have fun, and don't panic! ■



Is the tablet revolution over?

While they still outsell PCs, the rate is slowing.

The general argument that the PC is in decline has been substantiated by one fact above all others: people simply aren't buying as many personal computers. There are a few reasons for this, but the most commonly cited factor is the advent of the tablet. The introduction of the iPad in 2010 gave rise to massive disruption in the PC market, with millions upon millions of Apple and Android-based tablets selling in the years since, many of them in place of a PC purchase.

But new data from market research firm IDC indicates that tablet sales are now themselves seeing a slow-down. While tablet shipments are still actually rising, the rate of growth has dropped off substantially, slipping to an expected 19.4% in 2014 from 51.6% last year.

Tablets themselves aren't becoming any less popular, but rather the boom has ended as the market has matured;

many users already own a tablet device, and most won't upgrade until their current unit ceases to work.

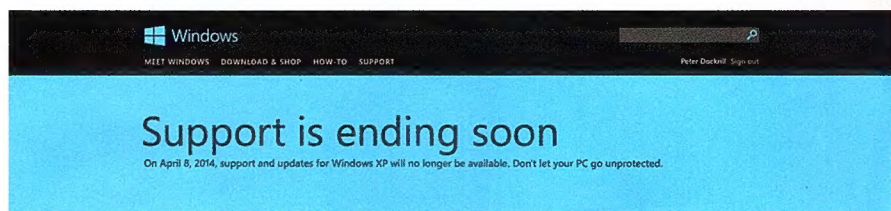
IDC also found that people are buying better-quality tablets, too. While a glut of cheapie Android-based devices has flooded the market in the past couple of years, the user experience they offer can leave a lot to be desired, and IDC notes "a consumer movement away from ultra-low cost products."

While iOS and Android tablets are by far the norm in the near-saturated consumer market, growing usage in the business sector is most likely to benefit another contender, Microsoft: "Though Android and iOS will remain dominant," IDC states, "we expect Windows-based devices to capture more than a quarter of the market as its benefits become apparent thanks to growing adoption of 2-in-1s." ■

\$8.9 BILLION

Untaxed profits Apple has reportedly shipped from Australia to Ireland.

According to the *Australian Financial Review*, in the past decade Apple has transported nearly \$9 billion in untaxed profits from its Australian business to 'Apple Sales International', which the newspaper describes as a "tax haven structure in Ireland". In the documents AFR has seen, Apple Sales International has gleaned some \$112 billion in profits internationally in the past five years, paying less than 50 cents in tax for every \$1,000 of income.



What is Windows XP end of support?

Microsoft has provided support for Windows XP for the past 12 years. But now the time has come for us, along with our hardware and software partners, to invest our resources toward supporting more recent technologies so that we can continue to deliver great new experiences.

As a result, after April 8, 2014, technical assistance for Windows XP will no longer be available, including automatic updates that help protect your PC. Microsoft will also stop providing Microsoft Security Essentials for download on Windows XP on this date. (If you already have Microsoft Security Essentials installed, you will continue to receive automatic signature updates for a limited time, but this does not mean that your PC will be secure because Microsoft will no longer be providing security updates to help protect your PC.)

If you continue to use Windows XP after support ends, your computer will still work but it might become more vulnerable to security risks and viruses. Also, as more software and hardware manufacturers continue to optimize for more recent versions of Windows, you can expect to encounter greater numbers of apps and devices that do not work with Windows XP.

29%

Percentage of PCs worldwide still running the end-of-life Windows XP.

The hour draws nigh. After some 12 years of official support for Windows XP, Microsoft will be turning off the updates for the venerable OS on April 8. This is kind of a big deal. It means nearly a third of the world's PC users will stop receiving security patches for their computers. Software reaches end of life all the time, but it's likely this mass ratio — nearly one in three users — has never before been seen, especially by a mainstream operating system. By comparison, Apple recently ceased support for OS X 10.6 Snow Leopard — a much more recent OS (four years old), but only used by a fraction of Mac users (and all Mac users globally still only amount to about 7% of computers in use).

US\$76 BILLION

Estimated wealth of Bill Gates, the richest person in the world.

Is it just our imagination, or is Bill Gates becoming more loveable with age? A decade or two back Microsoft's nerdy co-founder was widely portrayed in the media as a cold but brilliantly opportunistic businessman with unimaginable wealth and power. Becoming the world's leading philanthropist in the meantime seems to have softened the world's attitude towards Gates — he's now revered as some kind of awkward-but-almost-hip village elder of the tech community. One thing's for sure, the philanthropy hasn't hurt his riches any. Forbes' annual who's who of the richest people on the planet has Bill back at #1 in 2014. Take that, Carlos Slim.



BlackBerry owners scrambling to other smartphone platforms.

In a controversial promotional scheme offered by US telco T-Mobile, BlackBerry owners were offered US\$200 to trade their current devices in. The deal reportedly saw record-breaking trade-ins, with the ultimate sting being only one in 20 BlackBerry owners were upgrading to a newer BlackBerry device, with the vast majority jumping ship for iOS, Android or Windows Phone.

35 MILLION

Number of copyright images set to be released for free use by Getty Images.

Getty Images, keeper of the world's largest professional image library, has announced an innovative but controversial ploy to fight copyright abuse. It's removing the watermark on non-paid-for images, letting web sites and bloggers freely plunder and replicate its wares, provided that they use the company's new image embedding system, which links back to Getty's official licensing pages.

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» GADGETS



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THE SOLDIER 7800MAH POWER BANK

US\$90 | WWW.DIGITALTREASURES.COM

There are a lot of portable charging options out there, but the Soldier is specifically built for durability. Perfect for the next massive earthquake, flood, or zombie apocalypse, this pocket-sized unit is shockproof and dustproof, can withstand being underwater for up to 30 minutes, and has sealed USB and micro USB ports for extra protection. There's even a built-in flashlight in case you find yourself alone in the dark.



IN1 MULTI-TOOL UTILITY CASE FOR IPHONE 5/5S

US\$45 | WWW.IN1CASE.COM

If we had to guess, we reckon there's about 47.28 million companies out there making iPhone cases these days – even my local green grocer is in on the action. Most iPhone cases trade purely on looks, with a few going for genuine toughness and a smidge more on niche stuff like full waterproofing. The IN1 is a first though, effectively turning an iPhone 5 into a Swiss Army knife (well, one without the knife). The case holds a variety of small tools, including two pens (one red, one blue), two screwdrivers (one flat and one Phillips head), a nail file, tweezers, toothpick and scissors, so you'll be prepared for almost any (non life-threatening) emergency. Oh, and don't despair Android lovers – IN1's web site also promises a Galaxy S4 version is coming soon. (Just in time for the S5 launch, we presume...)





THE MIRACLE MACHINE

US\$499 | THEMIRACLEMACHINE.NET
Beer home brewing? That's so last year. And the year before. In fact, it's kind of timeless. But in any case, the DIY booze crowd is set to be astounded by... The Miracle Machine! The "world's first affordable accelerated winemaking device for the home" produces a bottle of plonk in just three days, using a few simple ingredients, some high tech sensors and a companion app for iOS and Android that helps you monitor the process of turning water into wine (literally). At least, *that's what the world was led to believe...* until the cat got out of the bag that it's actually just a viral hoax! Now that we're in on the gag, it does seem kinda fishy... but check out the promo video at tinyurl.com/obpkycv and tell us you don't want one!

PONOPLAYER

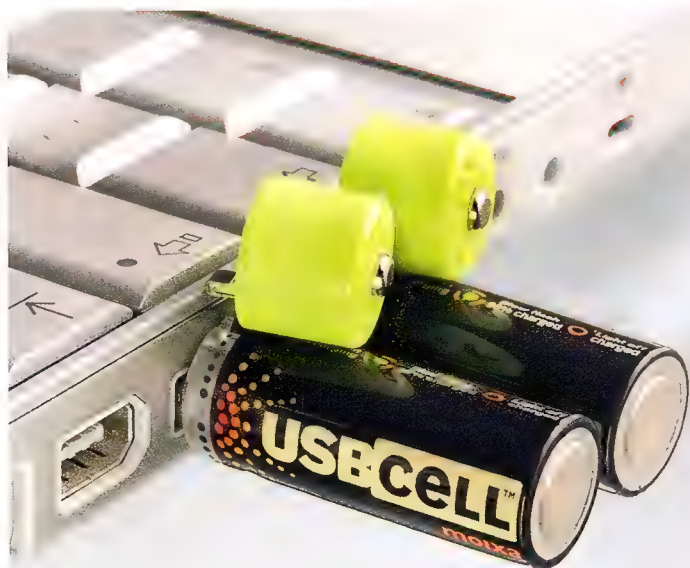
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iTunes and the iPod may have revolutionised the way we listen to music on portable devices, but not without making some serious sacrifices along the way. In fact, the leap from portable CD players to MP3 players is a rare example where a digital innovation actually sent content quality backwards a step or two, as over-compressed formats became the new norm to squeeze more songs into limited spaces. Fast-forward a decade or so and veteran rocker Neil Young has founded Pono – which means 'righteous' in Hawaiian, if you dig – to make an audio player and distribution platform that's all about quality, delivering pure high-def music "the way the artist recorded it". Still in development, the PonoPlayer won't be cheap – US\$399 for an unwieldy triangular prism that looks like a shelved Zune prototype. But true audiophiles won't care. It's all about the music, man.



USBCELL AA BATTERIES

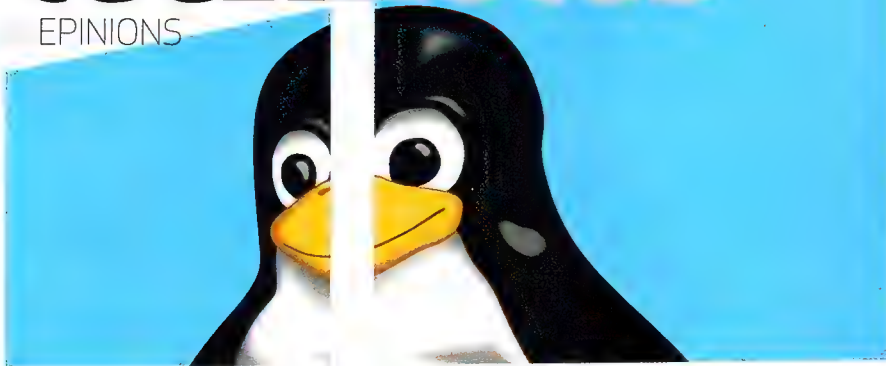
£11.61 (~AUD\$22) | WWW.USBCELL.COM

If you've ever wished for rechargeable batteries that weren't such a pain to, well, recharge – requiring dedicated bulky chargers – then check out the aptly-named USBCELLs. These nickel-metal hydride (NiMH) AA batteries have a flip-top head, under which hides a standard USB plug. That means you can plug them into basically any USB port (be that on your laptop, desktop or smartphone charge plug) to get juiced up. As with most things cutting-edge, there's a couple of caveats involved – the cells are comparatively low capacity at 1,300mAh a pop (you can find NiMH AA's at up to 2,500mAh), likely due to the fact that there's integrated charging circuitry inside each battery too. Don't expect rapid charging either – the manufacturer's web site claims a 90% charge will take about 5 hours. And that \$20-odd price means they're more than twice the cost of comparative Eneloops. We guess that's the price of convenience, eh? ■



technotes

EPINIONS



"Adopt open software, because I'm getting sick of being straight-jacketed into your proprietary environment."

MAKE WINDOWS 9 LIKE LINUX

The first thing Microsoft should do to fix Windows 9 is remove the Surface/Metro front end. It's ugly and childish-looking in the extreme. Second is to get rid of the damned Charms Bar and bring back the Start menu. Third is to allow me to install on a second or third machine without being told to buy another copy or plead to be permitted the get a key to install on a new machine. PCs and components do break and need replacing, especially hard drives. Please permit me to choose to install on another machine and treat me as honest until proven otherwise. Remove Internet Explorer from being physically part of Windows. I have my favourites and IE is unnecessary baggage I want to remove. Radically improve installation. I shouldn't have to take an hour and multiple restarts to install a modern OS. Every Linux distro I've installed has taken way under half the time of any Windows version, and that includes updating while installing and

Libre/OpenOffice as well. Damn your pay-by-the-month Office and future software you're planning Microsoft. I'm learning to adapt to and adopt open software because I'm getting sick of being straight-jacketed into your proprietary environment.

In the future, Microsoft should eventually base Windows on a Linux/Unix core as per Apple OS X and bring some stability, speed and modernity to the aged Windows brand. Linux/Unix would give a smaller, faster OS that could work better and faster on lower-spec equipment, in particular tablets and phones. From the offerings available now, it looks as if Microsoft's Windows paradigm is too bloated and complex to last much longer.

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It really needs a radical overhaul of the core OS kernel.

Start opening up the OS or you'll end up with 100% of an ever-shrinking market a-la Apple — which needs to open OS X to non-proprietary hardware or disappear.

Ian Hollis

EASIER TWEAK

Can I suggest a far simpler way than the ones your how-to column suggested for upgrading a Core i5-2500K system to a Core i7-4770K system? It's really, really easy. Just boot the new system off the old system's boot drive and let Windows 7 identify and find the drivers it needs. It's designed to do that, and is actually quite good at it.

Gordon Drennan

IS THAT A CRT IN YOUR POCKET?

Regarding APC's 400th issue and the history of the PC, my first computer was a Commodore 64 but I learned to program BASIC on a PDP11 at college. My current favourite gadget is an Android Nexus 4. It's still a really cool quad-core computer in my pocket (running a Commodore 64 emulator). I have a nice big ASUS ROG notebook that is as quiet as a mouse and I use it mainly for playing current games like Thief, Bioshock Infinite, Dishonored, Tomb Raider and so on.

My thoughts on the most important computing development? That'd be the flat-screen displays we all take for granted. From notebooks to MP3 players and smartphones to landline phones, even my electric kettle now has a digital display. Imagine carrying a CRT around in your pocket — I'm looking at you Space: 1999!

Wallace McGee ■

You know we've come a long way when the phone in your pocket is much more than just a phone, oh... and it's IN your pocket!



Not even a Bit of privacy

The controversial 'outing' of the alleged creator of Bitcoin raises some alarming questions about user privacy on the web, writes Peter Dockrill.

At time of writing, the hottest tech story on the planet is Newsweek's sensational claims to having uncovered the identity of 'Satoshi Nakamoto', the mysterious and long-hidden chief architect of the digital currency, Bitcoin. The magazine claims a man now known as Dorian Nakamoto is in fact Satoshi Nakamoto, publishing numerous details identifying him, including pictures of him, his house, his car and listing the locality in which he lives – all of which Newsweek argues are pertinent details in the public interest, as the real Satoshi Nakamoto and the currency phenomenon he created are very much matters of public concern.

In the days and weeks to come, no doubt more details will emerge, some which may help identify whether Dorian Nakamoto – who denies the claims – is in fact Satoshi Nakamoto. But what won't change is the ethical furore over the way in which the magazine and its web site unilaterally 'doxxed' a private citizen, sharing so much detail on him and his whereabouts that within hours he was being chased and hounded by the press.

The risks aren't merely an inconvenient but temporary media circus either – the real Satoshi Nakamoto supposedly retains control of a huge majority chunk of Bitcoins, worth literally billions of dollars. Even if the web myths surrounding 'Satoshi Nakamoto' are only partly true, outing Dorian Nakamoto – and his family's whereabouts – is a risky, even

downright dangerous act. Comments on Newsweek's online story seethe with reader outrage over this tactlessness: "You really should take off the picture of his house... what are you, insane?";

going to jeopardize this man and his entire family's lives."

In Newsweek's defence, if Dorian Nakamoto is indeed the creator of Bitcoin, he hardly hid his tracks with competence. He published the original Bitcoin paper in his own name (which since has only partially been changed), and has subsequently posted numerous other pieces of content online under the same name, including photos and comments.

The question is, if he didn't act with total anonymity, is he entitled to it?

Leah McGrath Goodman, the journalist behind the story, answers no. In a video response addressing the controversy over Newsweek's actions, she points out: "The fact he posted under his own name hundreds of statements [on Bitcoin forums], he certainly didn't want to be completely anonymous... In so far as he wanted to remain anonymous, I supposed maybe you would not do that."

The sad truth is that in today's breadcrumb-laden digital society, the same argument could be used against any of us. Take away the high drama – the money, the notoriety and the tale of the secretive genius in hiding – and any of us could suffer the same exposures as Dorian Nakamoto. While there's nowhere near as much interest in the doings of Joe and Jane Average, the prevailing, harsh logic can still be applied: if people voluntarily share aspects of their lives online, they're not entitled to an expectation of privacy. ■



"Really, his real name, where he lives and his picture? Why didn't Newsweek just hire a hitman while they were at it.",
"This absolutely disgusting article is

ENDUSER

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GEFORCE GTX 750 TI

Nvidia's first Maxwell card — a portent of things to come...

Well, this is a first. Here we are with a brand new GPU architecture from Nvidia and for once it's not debuting in some flashy \$800 top-end graphics card. Instead, Nvidia has decided to introduce the new Maxwell design in a mainstream graphics card, the GeForce GTX 750 Ti, right from the off.

That's why there's been no bombastic launch here, no lengthy deep dive sessions in some dusty conference room, and barely a whimper from the engineers involved. Nvidia is essentially testing the Maxwell waters.

Nvidia is calling this GTX 750 Ti Maxwell's first generation of GPUs, but in these days of Early Access it feels almost like a beta release of a graphics architecture. That may sound a little unfair — this isn't some half-baked release or a buggy silicon setup. We're only phrasing it in such language to indicate that this is a very different

architecture debut to those we've previously seen from the mean green machine.

It's actually rather smart of Nvidia to roll out Maxwell in this way, especially if you take a look at Nvidia passim. Historically, things haven't gone particularly well when it rolled out a new graphics architecture at the same time as a drop in the production process. We're looking at you, Fermi... When the GTX 480 was first introduced on the 40nm process, the yields weren't great; the chip came out frighteningly hot and power-hungry. It wasn't really until the GTX 580 update that the Fermi architecture actually matured.

Keeping the new GTX 750 Ti and its Maxwell architecture on the same 28nm lithography as the previous generation means that Nvidia has been able to iron out architectural bugs without having to worry about unforeseen process problems, and since 28nm yields are as good as they're

likely to get, it makes perfect sense for a mainstream, high-volume card to roll out on a process that's going to be produced in numbers.

It's almost aping Intel's method of CPU production — its tick-tock cycle. Intel creates a new architecture on an existing production process and then refines the same architecture with a die shrink — the tick being the shrink and the tock being the new microarchitecture. This could just be a happy accident of circumstance.

As far as we know, Maxwell had initially been penned in for the 20nm process, but TSMC has had some problems with new technology shrinks stretching back to the 40nm to 32nm drop. That node was eventually cancelled and it went directly to 28nm — where it has managed impressive yields — with the 20nm process not likely to enter into mass production until the first quarter of this year.

Without Nvidia knowing for sure when it would be

able to get significant volume on a new lithography, it had no choice but to release its new architecture on an existing production process.

ULTRA EFFICIENT

Enough of the whys, though. What is Maxwell all about? In a word: efficiency. That's been the buzzword around pretty much all of our technology in recent years, but it has taken GPUs a long while to catch up. The graphics card is most likely the hottest and loudest part of your PC, and that's partly because we've allowed it to be. We want the fastest, smoothest frame rates in our games and we'll happily sit on a turbine to get there.

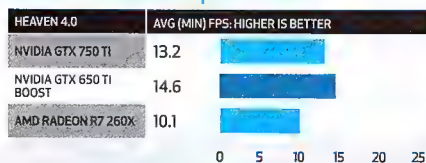
But the times, they are a-changin'. Whereas once you could safely rely on a new die-shrink to offer the chance to get more processor logic into the same space at an equal cost or less, the technological demands of ever-shrinking transistors is rising more and more with each shrink in process — and that rising cost of development comes hand in hand with production cost increases. In order to be able to get more with less, as much performance per watt as is technologically possible must be developed. And that is Maxwell's *raison d'être*.

The upshot of this is that graphics cards will get more efficient in terms of power demands and temperatures. The first seeds have been sown with the advent of this 28nm first generation Maxwell GPU and will only improve with the move to 20nm.

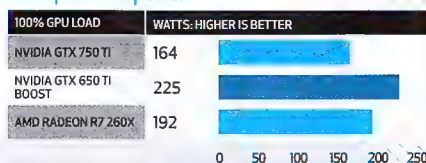
In terms of the architecture, Maxwell inevitably shares DNA with Kepler and Fermi, being made up of many little CUDA cores for that parallel processing goodness we know and love. It's the management and arrangement that's different. The big change is in the streaming microprocessor. The SM has evolved from its first appearance with the Fermi architecture: it was redesigned as SMX for Kepler and now as SMM with Maxwell.

LABS BENCHMARK RESULTS

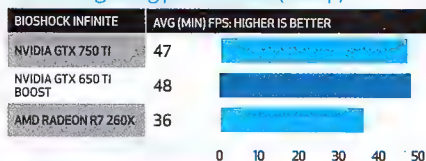
DirectX 11 tessellation performance



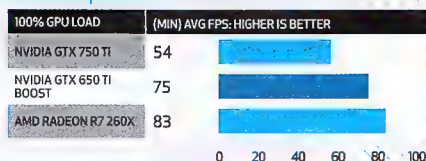
Peak platform power



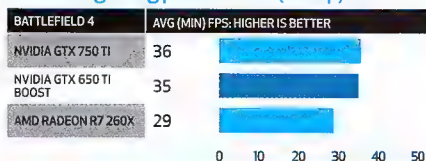
DirectX 11 gaming performance (1080p)



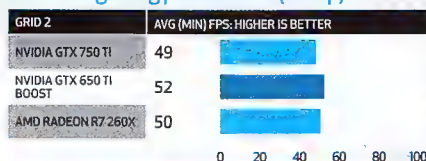
Peak temperature



DirectX 11 gaming performance (1080p)



DirectX 11 gaming performance (1080p)



"This GTX 750 Ti is able to sit alongside the likes of the GTX 650 Ti Boost in terms of performance."

The new SMM re-organises the control logic and the CUDA cores themselves. With the previous design, each SMX housed 192 CUDA cores that were looked after by a single piece of control logic. With Maxwell, every SMM is divided into four quadrants, with 32 CUDA cores in each, and each with its own control logic. That does mean there are now only 128 cores in every SMM, but each of the four processing blocks has its own instruction buffer and scheduler to improve efficiency and overall processing speed.

The SMMs are now smaller, which means that Nvidia has been able to squeeze five of them into this GM107 GPU. This added logic and higher number of streaming microprocessors – analogous to what AMD is now referring to as compute cores – adds to the parallel

processing power of the Maxwell chips and, according to Nvidia's testing, means it can deliver around 35% more performance from each CUDA core.

That's why this GTX 750 Ti is able to sit alongside the likes of the GTX 650 Ti Boost in terms of performance, despite being much lower-powered and having fewer CUDA cores housed within. The GM107 GPU is the inaugural Maxwell GPU, and the GTX 750 Ti represents the chip at its full implementation. There is also a GTX 750, which is running the same GM107 GPU but with one less SMM and half the video memory.

The frame buffer is another part of the story though. The GTX 750 Ti is running with a pair of 64-bit memory controllers for a total 128-bit aggregate memory bus to run its 2GB GDDR5 VRAM. That doesn't

seem like much, but on a mainstream part it can be expensive to double the memory controllers in terms of both cost and power. Nvidia has therefore decided to improve the internal bandwidth. And to make sure the bandwidth of the 128-bit bus isn't an issue, the GM107 comes with a hefty 2MB of L2 cache. Compared with the GTX 650 Ti's 384KB of L2 cache that's quite a jump, and helps to ensure that the VRAM isn't such a bottleneck.

All this talk of efficiency and elegant design solutions is one thing, but how does she actually perform in the real world? Well, we might have to start managing expectations for Maxwell – this isn't a massive leap forward in graphical performance on a card-for-card basis. The GTX 750 Ti performs at around the same sort of levels as the now-retired GTX 650 Ti Boost. In some benchmarks it's quicker and in some it's slower, but generally speaking it's much of a muchness. These are GPUs retailing at similar price points and it's essentially a like-for-like replacement.

THE FUTURE'S SMALL

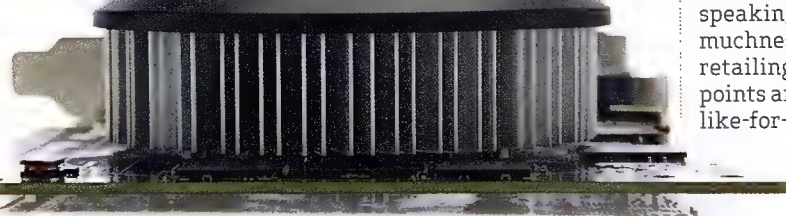
Without any architectural details, it would be easy to see the benchmarking data and conclude that Nvidia has been following AMD's rebrandathon approach to 'new' GPUs. If you were just looking at the frame rates, then you might conclude that it was just a GTX 650 Ti Boost with a new sticker.

It's clearly different, when you look at the board itself, the temperatures it hits under load and at the power it's drawing. For a start, this board is tiny – we'll also see some half-height designs – and because it also draws all the power it needs from the PCIe bus, it doesn't need any external power connectors.

That's exciting because it means that those poor folk who are sitting on some plain ol' PC without the sort of PSU that doesn't have the capacity or PCIe connector to spare for a modern graphics card now have an upgrade path. The GTX 750 Ti will happily potter along at over 30fps in most modern games at the highest 1080p settings. That means you can drop the settings down a notch and get great gaming performance. Some of the minimum frame rate numbers aren't looking too healthy, but that could be a result of immature drivers for what is a brand new GPU architecture.

This all bodes well for the future of the 20nm, second generation Maxwell GPUs that will form the vanguard of the GTX 800 series. If the GTX 680 was an impressively efficient top-end card at the time, then the GTX 880 ought to be something rather cool, quiet and powerful. We're also hoping for some svelte single-slot 8800GT tribute acts too. ■ Dave James

The 750 Ti has far fewer CUDA cores than its 650 Ti forebear.



Verdict

Features
Performance
Value



A good value card, with great temperature control and power efficiency. It's a taste of what's to come.





LABS BENCHMARK RESULTS

General system performance

CINEBENCH 11.5	CPU
MULTI	6.58
SINGLE	1.43

X264 HD BENCHMARK 4.0	AVERAGE FPS
PASS 1	148.68
PASS 2	37.33

General system performance

	AVERAGE FPS
BIOSHOCK INFINITE	42.1
GRID 2	60.1
METRO: LAST LIGHT	35.33
TOMB RAIDER	63.7

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VENOM BLACKBOOK 14 ZERO

A compact all-rounder that's still up for a bit of gaming.

Lets be frank for a minute: in the rows and rows of laptops that adorn many of Australia's major electronics retailers, it can be pretty hard to stand out. It's therefore good to see a machine from an Aussie mob – Melbourne-based Venom Computers – taking a fair crack at it.

The 14-inch BlackBook 14 Zero has the kind of well-thought out set-up that'll please both enthusiasts and executives alike. Our \$2,389 test unit packed a 240GB SSD (for OS, game and app storage) alongside a bigger 1TB traditional hard drive (for less performance-reliant needs – read: music and movies), a top-drawer quad-core Intel Core i7-4750HQ CPU, 16GB of DDR3 memory and a 14-inch matte-finish 1080p display, with Windows 8.1 Pro as the OS. That all combines to make for a laptop that's exceedingly fast and fluid to use – it'll put many a desktop to shame when it comes to

responsiveness – but it's perhaps in the GPU where the Zero is most interesting. This is the first laptop we've tested that includes Intel's Iris Pro 5200 graphics processor, the chip-giant's fastest GPU to date and one that's mostly capable of running the latest games.

How capable, specifically? To answer honestly, we'd have to say "reasonably". We ran a range of recent release games on the Zero and found that, at native 1080p resolution with Normal/Medium graphics details, it was a bit of a wash. Two of our four test games didn't hit 30fps – making them basically unplayable – and the other two didn't leave a lot of headroom, only managing 34 and 44fps respectively. Drop the resolution down to 720p (1,280 x 720-pixels) and it's a different story. Here, every one of our test games – even *Metro: Last Light* – chugged along at above 30fps with Medium details, with *Tomb Raider* hitting a quite-reasonable 64fps. So, the Zero is

capable of letting you play the latest games, albeit with some slight compromises required.

It's also a great machine more generally. Physically, there's a reassuring solidity to almost every aspect of it. From the well-sized, -spaced and sturdy keyboard keys to the smooth and stable action of the screen's hinge and even the premium feel of the plastic used in the Zero's chassis. Under the hood, there's an Intel-designed convective cooling system that actively draws in cool air while exhausting the hotter stuff – and it's pretty effective and reasonably quiet. You will notice when it kicks into gear, but you won't have to raise your voice to talk over it. It all combines for a laptop that looks, feels and performs first-rate.

Venom also went to great pains to stress to APC that it only uses A-grade components in its BlackBooks, highlighting motherboards and

displays in particular. In essence, Venom's paying more at the production end of things to ensure its machines are well-made; that's still a win for Venom, which won't have to fix dodgy machines.

While the Zero isn't quite going to take on the likes of a Razer Blade for style or gaming speed, at around \$1,000 less it's a laptop that's within reach of many more of us. In short, if you want a slim, light and powerful laptop that's still up for a bit of modern gaming, then the Zero is an easy one to recommend.

■ Dan Gardiner

Verdict

Features	★★★★★
Performance	★★★★★
Value	★★★★★

A compact, well-made and powerful little machine with just enough gaming grunt to scrape by.





BATTLEFIELD 4

PREPARE 4 BATTLE

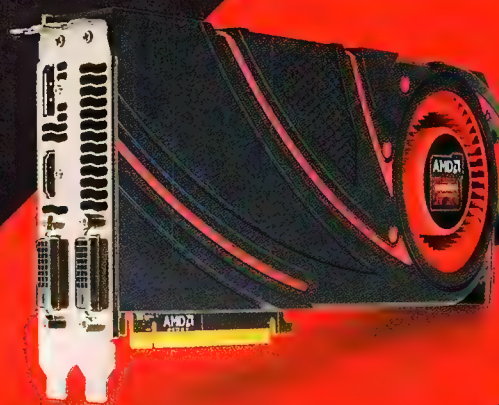
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¹Application support for Mantle is required. Updates to Battlefield 4 enabling Mantle to be released at a later date. Please visit www.facebook.com/amdbattling for updates.

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"Hyper-Threading and improved Haswell cores boost the performance in the ThinkCentre E93z"



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LENOVO THINKCENTRE E93Z

Good power, average everything else.

Designed for small to medium-sized businesses, the ThinkCentre E93z all-in-one aims to deliver computing firepower in an attractive package.

The glossy 1,920 x 1,080 21.5-inch 10-point touchscreen monitor is smaller than we'd like, considering most other all-in-ones (AIOs) are in the 23- to 27-inch range. This, in addition to the large bezel, makes it look a bit dated.

The TN panel looks dim at extreme viewing angles. The E93z also comes with a 2MP webcam, which isn't out of the ordinary.

On the left are two USB 3.0 ports, an SD card reader, and a single combination audio and mic input. Behind the panel are four USB 2.0 ports, Ethernet port, and separate in/out HDMI ports. Finally, the DVD burner, volume rocker, HDMI input switch, and power button are on the right of the unit.

The E93z packs some CPU firepower. Our configuration came with an Intel Core

i7-4770S, which carries a base clock of 3.1GHz and can turbo up to 3.9GHz. And while the E93z is billed as a work PC, we aren't stuck with integrated graphics. Instead, it has a new GeForce 720A GPU. Unfortunately, the AIO skimped in two areas: a mere 4GB of RAM in a single-channel package and a paltry 500GB of storage. To its credit, it is a hybrid drive and you can opt for a 1TB hard drive, but it would have been nice to have the option of both an SSD and a beefier HDD. You can up the RAM to 16GB, but at this price, we think it should have at least 8GB already.

Regardless of the limited RAM, the E93z killed it in our CPU tests. It made our ASUS ET2300 Ivy Bridge 3GHz Core i5-3330 seem ancient, besting that system by 8-12% in single-threaded tests and obliterating it by 52% in the multithread-heavy x264 HD 5.01 benchmark. Both are quad-cores, but the Hyper-Threading and improved Haswell cores boost the

performance in the E93z.

Things weren't as definitive in the graphics benchmarks. Both GPUs are similar in class, with the Lenovo's 720A having zippier memory and boost clocks, while the ASUS's 630M has a slightly faster GPU clock and double the memory bus width. Lenovo enjoyed a 7% lead in 3DMark 11, but lost by 15% in our Metro 2033 benchmark. This ain't for replacing your gaming rig.

All of this sits atop a circular-based stand that provides the monitor a 70 degree range of tilt, giving it the versatility to be used both while sitting and standing. The stand also has a small ring for routing the power and USB cables.

Both keyboard and mouse are wireless. The full-size keyboard is comfortable, with retractable feet for those who prefer typing at more of an angle, we wish it had LED indicators for the caps lock button and other toggles. The 400-DPI mouse also gets the job done, though you'll most likely want to

tweak the sensitivity.

The touchscreen was responsive but fairly standard; it didn't live up to its "lag-less" billing, although lag was minimal. We were surprised that the two three-watt speakers offered ample volume but didn't like their positioning on the back; it felt like sound was moving away from you instead of toward you.

The E93z offers great CPU performance but is mediocre to average everywhere else. The system's relatively small TN panel, scant 4GB of RAM, and very limited storage options prevent us from recommending it.

■ Jimmy Thang

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

Awesome CPU performance; good assortment of ports.





CPU COOLER

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ANTEC KUEHLER H2O 1250

Good things come in small packages...

Iwant to hurt this cooler, and I'll tell you why — because it bends over backwards to accommodate every chipset in production since Victorian times, and in doing so makes it nearly impossible to install it on any of them on your own.

You'll need to remove your motherboard from the case and lay it on top of the backplate on a flat surface, while praying to the gods that by doing so, you don't accidentally dislodge one of the screws and have to start over. Then it's time to mount the cooling block, hoping that all the loose moveable parts stay in the desired position. Then simply screw in the mounting screws, crossing any spare fingers that the block doesn't twist loose from its cradle.

Physically, it's also big and problematic. You can't install the radiator inside the case and the fans outside, and unless you've got a full-size tower, low profile memory and mobo heatsinks, you can't install it inside.

Antec is clearly chasing performance over practicality with this model, and the frustrating thing is that it performs pretty well. Idle CPU temps are cool enough to touch at 26°C, and don't veer above 39°C under max load, even with the fans operating in near silence. Unfortunately it's less dynamic in terms of peak-to-idle performance, taking almost four minutes to chill the chip to its idle temperature after heavy operation.

If you got home and saw it already installed in your rig, you'd be impressed, but with so many hurdles to jump during the installation phase, it's difficult to warm to this cooler. ■ Phil Iwaniuk

Verdict

Great temperatures and an interesting dual-pump design, but there are pacemakers that are easier to install.



CPU COOLER

\$160 | WWW.CORSAIR.COM

CORSAIR HYDRO H105

Unlike Bieber, Corsair's new cooler has more fans than ever.

Corsair's newest self-contained liquid CPU cooler riffs on last year's Hydro H80/H100 and like those forebears, the H105 is relatively easy to install. Gone are the days of wrestling an octopus of tubes into submission by force-feeding it cooling fluid, then replenishing that fluid as needed. Starting the installation requires you to screw in a backplate under your CPU, install the pump in your case and secure it in place using thumbscrews — a relative breeze thanks to moveable mounts and nice compact-sized pump unit.

Once you pick up the radiator, the trouble begins. At 38mm thick, its heat dispersion is impressive, but physically it's a space hog. In anything smaller than a full-size tower, there simply isn't room to house both the radiator and fans inside.

At full speed, those fans aren't the stealthiest blowers on the market either. With the H105 at full RPM, your

PC sounds like a commercial jet taking a nosedive, and even below 50% the noise is noticeable.

Though it didn't bring idle temperatures below the Kuhler's 26°C, the Corsair does keep load temps much cooler, and returns to idle temps quicker after periods of maximum load, too. In fact, you can run the fans below 20% and still get idle and load readings comparable with a good air cooler at a higher RPM.

The Hydro 105's strengths and weaknesses are an inverted mirror image of the Antec's — if you want quiet fans and low idle temps, plump for the H2O 1250. For an easier install and better heat dispersal, this is for you. ■ Phil Iwaniuk

Verdict

Well-designed installation parts make the pump a pleasure to fit, but that hefty radiator unit won't squeeze into all mid-tower cases.



"The only fly in the ointment is that aftermarket cards from ASUS, EVGA, Gigabyte, et al, cost less, allow similar if not better overclocking, and are almost as quiet."



\$35 | WWW.NZXT.COM

NZXT KRAKEN G10

An expensive GPU cooler, but it's colder than a witch's you-know-what.

NZXT's G10 bracket is a unique GPU cooler that takes advantage of one incontrovertible fact of today's liquid-cooling market: Most of the coolers out there are designed by Asetek. This snazzy adapter lets you take any Asetek CPU cooler (yes, we said CPU cooler) and bolt it onto your GPU to deliver a level of cooling performance that is simply not possible with an aftermarket air cooler.

The brackets, which are available in black, red, and white, attach to a wide variety of GPUs, including all the AMD and Nvidia cards made in the past several years, with the only exceptions being some Radeon R9 280 and HD 7900-series cards.

We actually failed to read this little note in the instructions and installed it on a Radeon HD 7970 at first, only to see GPU temps skyrocket to 100°C within five seconds of a load being placed on the card, indicating insufficient

contact between the water block and the GPU die. NZXT notes that some GPUs have recessed dies, and will need a shim, which are available online for \$4. As the saying goes, "Ain't nobody got time for that!" so we moved onto a Radeon R9 290X for testing.

We figured it was the best candidate anyway, since it's notoriously hot and loud. If the G10 could tame that wild beast, it could certainly handle a cooler-running Kepler board, as well. Cooling was provided by a Kraken X40 CPU cooler, also by NZXT, but any Asetek-based CPU cooler would work, including models made by Thermaltake, Corsair, Zalman, and Antec.

Installation was painless. We removed the stock cooler, fitted four long screws through a backplate, poked it through the board, then lowered the G10 bracket (with the water block attached) onto the GPU heat spreader. Four nuts were secured to the screws, and it was in

place. Next, we mounted the radiator and fan inside our case, then connected the 140mm fan to a header on the bracket. There's a VRM fan on the G10, and it also attached to a header on the G10. Power for the pump and the fans comes from a lead that connects to a USB header on the motherboard. Overall, the installation was straightforward and easy to follow.

Upon our first boot, we noted that idle temps were around 40°C, which is very low. Once we began to push the card, instead of rising to its normal 94°C, we saw temps slowly rise up to around 53°C and then stay there throughout testing.

This let us overclock the card to a scorching 1,120MHz, netting a 10% gain in performance. It's also extremely quiet, and with the Kraken Kontrol software we were able to fine-tune the fan curve, or select modes such as Extreme or Quiet.

Overall, the G10 is the best GPU cooler we've ever

tested. It's ultimately expensive, sure, but performance like this is never cheap. The only fly in the ointment is that aftermarket cards from ASUS, EVGA, Gigabyte, et al, cost less, allow similar if not better overclocking, and are almost as quiet. Obviously, if you're running a closed-loop CPU cooler, you'll also want to make sure you can fit two coolers in the case.

If you must do water, this is the way to go. Thrifty upgraders will want to just go with a GPU with a non-reference cooler, though. ■ Josh Norem

Verdict

Features
Performance
Value



Impressive performance and easy to install, but adding the required CPU water cooler makes it all too costly.





"Push your mouse and keyboard aside, slide it towards you and push the screen down, and it almost becomes a powerful, desk-based tablet. Almost."

MONITOR

\$599 | WWW.SAMSUNG.COM/AU

SAMSUNG S24C770T

A flexible monitor for those that want to go hands-on.

After Christmas, I spent some time in Las Vegas dallying with AMD and its Kaveri chips, Nvidia and its G-Sync monitors, Valve and its Steam Machines, and Intel and its perceptual computing interface shizzle. Intel wants us to get excited about waving at screens with built-in 3D cameras that recognise our facial expressions, moods and deepest, darkest desires. Intel was showing off working versions of this technology at CES.

So why is Samsung pursuing such an outdated technology as touch? I mean, who wants to stroke a screen when you can just waggle your digits at it?

Well, when I said Intel was showing off 'working' versions of gesture recognition, etcetera, I was maybe being a little generous. Our PCs, monitors and 3D cameras may now be able to recognise gestures, but

they still can't translate them into anything useful or dynamic on-screen, so thank the stars touch is such a mature interface.

Sadly, though, that's only true on phones and tablets. On desktops and laptops, touch is an unpleasantly laggy process. The day we get one-to-one correlation between the sweeps of our fingers and the swoops on our desktops will probably also be the day Intel understands the concept of a good end-user experience.

Samsung's S24C770T is therefore probably already on a hiding to nothing, but the physical setup was the first thing that drew me to it. That sliding tilt stand, which allows it to drop towards your desk like a technical drawing board, makes it more intriguing than most touchscreen displays. Push your mouse and keyboard aside, slide it towards you and push the screen down, and it almost becomes a powerful, desk-based tablet. Almost.

Unfortunately the Windows interface lags behind any touch, whether that's moving down a web site or flicking through your Windows 8 apps. Brushstrokes track sluggishly and inorganically in ArtRage (painting software), and shifting folders and windows around your screen remains an unpleasantly elastic experience.

And it's those touch capabilities that add the vast price premium to this 24-inch IPS screen. \$599 is a huge amount of money, especially considering it's not even particularly good as a standard monitor.

There's a grittiness to the panel, which is there because of the touch tech, and the shiny cover over the top of it means it's hugely reflective in any room that isn't pitch black. Even then, you'll see your face mirrored in the glow of the backlight.

There's also a noticeable amount of inverse

ghosting when you're shifting stuff around the screen. The black levels are pretty poor, and the contrast is a way off, too. This isn't something we're used to from Samsung's traditionally excellent panel technology, but clearly it has had to compromise in order to please the touchy-feely crowd.

If the S24C770T was a better monitor and not so expensive, with the touch tech there as a neat extra feature, we'd be more impressed. As it is now though, there's little to recommend it.

■ Dave James

Verdict

Features ★★★★★
Performance ★★★★★
Value ★★★★★

Not a great touchscreen, which isn't Samsung's fault. Not a great monitor either, which most definitely is.



"As a 1080p DLP projector, the W1500's picture is amazingly crisp and packs plenty of high-contrast pop."



PROJECTOR

\$1,899 | WWW.BENQ.COM.AU

BENQ W1500

What's wireless HD projection worth to you?

Trade-offs. That's typically what display technology is all about. Fancy crazy-high 4K resolutions, or maybe ultra-fast refresh? Bottom line: you can't have it all. And if anything, that applies more to projectors than any other display type.

On the plus side, there's certainly nothing as cinematic as a projector. Forget your 70-inch curved-screen HDTVs, they don't even come close – which is intriguing, given the fact that a full 1080p beamer can be had for less money than premium HDTVs. But hark, is that the clip-clop of a proviso trotting happily in the direction of this baggy, indulgent review intro? Yup. The problem is that projectors are pretty inflexible. In our opinion, they're basically no good for daytime viewing – even the brightest ones will always struggle.

They're also tricky to set up, require a projection

surface, and need some distance between the surface and projector itself. If you own a dedicated home cinema room, that's dandy. If you don't, it's probably going to be a challenge to achieve a setup that doesn't create clutter.

This is precisely where the BenQ W1500 comes in. Thanks to its wireless HDMI functionality, you have a whole new world of options when it comes to installation. No longer do you need cable connectivity to the playback device – namely your PC. Instead, you merely plug BenQ's wireless dongle into your computer, select 'Wireless' from the projector's sources and configure the display as you would any other.

Well, almost. With our AMD Radeon test card, we couldn't achieve an extended display setup. The W1500 would only hook up wirelessly as the sole, primary display. Pity.

There's another slight problem too: signal strength. The wireless HDMI link really only works line-of-sight in the same room. You may be able to achieve a link with the two devices in different rooms, but the video is blocky and ugly due to low data rates at distance. That aside, with good signal, the wireless image quality is flawless and indistinguishable from using a HDMI cable.

As a 1080p DLP projector, the W1500's picture is amazingly crisp and packs plenty of high-contrast pop. Recently, affordable projectors have improved and the W1500 looks good for its 2,200 lumens and 10,000:1 contrast ratio. Fire up some really well-encoded 1080p content, something like *The Dark Knight Rises* on Blu-ray, and you'll wonder if you ever need to go to the cinema again.

The downside – one of those inevitable trade-

offs we mentioned – is a fair dose of the dreaded DLP rainbow effect. For that you can thank the 50Hz, 6-segment colour wheel. A 120Hz wheel would be preferable. That said, not everyone can detect the flashes of colour involved with the DLP rainbow effect.

All of which makes the W1500 a bit of a mixed bag. It sports tonnes of features – we haven't even had space to talk about its 3D support – but at this price point there are certainly better choices for pure image quality. You pay your money. You take your choice. ■ Jeremy Laird

Verdict

Features
Performance
Value



Wireless HDMI connectivity has some limits. There is a seriously cinematic image, bar a bit of rainbow effect.





PC CASE

\$85 | WWW.ANTEC.COM

ANTEC ISK 600

If budget is a concern, this case could be what you're after.

Antec's ISK 600 is a cheap chassis, and it does indeed look basic when compared to the big guns of Corsair and Lian-Li.

It's eminently functional, though. You can put a standard size power supply into the box but you won't find space for the extended über PSUs or the mountings for the sort of small form factor supplies required by some Lian-Li's. Slightly unusually, the PSU is mounted right behind the front panel, drawing cool air in from the front vents and exhausting the hot air out the side.

It's big enough to house as long a graphics card as you would care to put into a mini-ITX mobo, and has a fair amount of space for a GPU. It's pretty easy to build into and offers excellent motherboard access once the noise-dampening HDD drive tray has been lifted out of the top. The cooling performance may be one issue though as there is only a single 120mm fan on the

rear to work in conjunction with your CPU cooler. However, you could drop a 120mm liquid chiller into the box and mount it on the rear without too much concern. Although the rig's ambient temperature could become an issue without an air cooler creating airflow through the chassis. With the brushed aluminium sleeve slotted on, there are only two vents on the case near the front – one for the PSU and the other for the GPU. The ISK 600 isn't going to win any style awards thanks to its plastic front panel and cheap-looking power/reset switches, but if you're on a budget, it will still allow you to build a proper mini gaming machine.

■ Dave James

Verdict

A functional case for those on a budget. It's not going to win any style awards though.



PC CASE

\$160 | WWW.NZXT.COM

NZXT H440

Remarkably clean, but limited, too.

We love the fact that NZXT bills this semi-silent case as a "hassle-free experience." We wonder if the company was using the same case that we were, because we encountered quite a bit of hassle with this smaller-than-usual chassis.

The case itself ships with no printed manual – at least, ours didn't – and there are definitely some features that warrant a bit of instruction. Case in point: There are absolutely zero 5.25-inch bays to be found, which is a good thing to know before you start attempting to pry off the H440's front (Dremel in hand). Additionally, installing the PSU might evoke a bout of head-scratching, as there's seemingly no way to just stuff it into the chassis thanks to how it's been compartmentalised on the case's bottom. There's also a lot of screwing with this chassis. You have to unscrew a panel to slide the power supply in, unscrew the

standard PCI slot covers for any devices you want to install, and you have to first unscrew the case's steel drive trays to screw in your hard drives. Clean, yes. Toolless, no. The foam surrounding the case's insides also makes things tight and can constrain cable routing. That said, despite the smaller-feeling interior it adequately supported our standard test setup (including a Titan-sized Nvidia graphics card) without any cramming. As for sound, there are four of NZXT's next-gen case fans: three 12cm fans on the front and one 14cm fan on the back. While we appreciate NZXT's efforts toward keeping the volume down, it seems to be a bit of a lost cause. ■ David Murphy

Verdict

Excellent placement of (limited) cable-routing holes; ample air cooling; lovely looks.



ASUS®



ADVERTISING FEATURE

Out of the box computing

ASUS's VivoPCs pack desktop computing in a palm-sized package.

Slim and stylish, the VivoPC VM40 blends in to your living room. DIY hard drive and RAM upgrades are made easy.

This super slim external optical drive is the perfect upgrade for your VivoPC.

The VivoMouse is a stylish optical mouse and gesture-enabled touchpad in one.

Banishing the idea that a computer needs to be a large box under your desk, ASUS has launched the VivoPC. Tiny yet fully featured, this Windows 8 PC is as home in your living room as it is in your home office. More than just a minute desktop computer, the capable VivoPC is the perfect machine to become the centre of your new digital home entertainment system.

HANDS ON WITH THE VIVOPC VM40B

The VivoPC is tiny, measuring in at just 190mm on each side and only 56.2mm high. It's also understated and stylish, with a simple silver chassis that won't look out of place nestled in with your Hi-Fi equipment. Inside is a cool and energy efficient Intel Mobile CPU and from 4GB up to 16GB of RAM. It's also got a 500GB or 1TB 7200rpm 3.5-inch HDD as well as Intel HD graphics built in. Round the back of the

VM40B is an excellent array of connectivity – two USB 3.0 ports handle high speed transfers, while an extra four USB 2.0 ports let you connect plenty of peripherals. The HDMI port is perfect for connection to your TV or a monitor to deliver both audio and video with a single connection. You also get a handy VGA socket to connect to older displays or a projector. The VivoPC also has a Gigabit LAN port, 802.11ac Wi-Fi and Bluetooth V4.0 to get it on your network and interacting wirelessly with your other equipment. With built in SonicMaster speakers, sound quality is great, though it features optical (S/PDIF) audio output so you can connect into your existing AV gear. The VivoPC also has a 3.5mm audio line in port, headphone output and microphone connection.

For those who like to tinker a little, the VivoPC is also set up for easy DIY upgrades. Swapping out the hard drive is as easy as popping of the top of the

VivoPC – no tools are necessary. Even the RAM is accessible with only a Phillips head screwdriver.

YOUR DIGITAL LIFESTYLE

Unlike a larger, noisier desktop, there is no need to hide your VivoPC away – it blends effortlessly into your living room. It's also very quiet and thanks to the energy efficient hardware, can be left on without putting a strain on your power bill. While the VivoPC itself has plenty of room for storage and can be used as a media server, it can also stream media from other devices, such as a NAS. It's equipped with ultra-fast 802.11ac 5GHz Wi-Fi which has more than enough bandwidth to handle Full HD video streams without any stuttering. It's also got a combined SD/MMC card reader, so you can pop in your camera memory card to back up shots or view snaps on the big screen.

When combined with ASUS's Wi-Fi GO! software, you can use your existing smartphone or tablet as a

remote control. From playing music, to streaming video or even browsing the web, the VivoPC is totally controllable without ever getting up from the couch.

The VivoPC comes with 32GB of ASUS WebStorage, free for three years. This lets you backup your photos online, share them with friends and family, access your files anywhere with an internet connection and stream music to your portable devices.

THE ULTIMATE ASUS ENTERTAINMENT SYSTEM

Rather than being just a standalone system, ASUS has matched the spun metal VivoPC style with a range of other devices that can be linked together into an unobtrusive yet fully featured media center.

VIVO MOUSE WT720

Designed to make interacting with your media PC easy, the VivoMouse has a unique touchpad instead of buttons. It even recognises gestures and is easy to operate with one

VivoPC VM40 specs

- Intel Mobile CPU
- Intel HD graphics
- 4GB RAM expandable with 2 x SODIMM slots
- 500GB or 1TB HDD
- 802.11a/b/g/n/ac Wi-Fi
- Bluetooth V4.0
- Gigabit LAN
- 2 x USB 3.0, 4 x USB 2.0
- D-Sub/HDMI output
- 190 x 190 x 56.2 mm
- 1.2kg

Add a cinematic 21:9 ASUS screen for the ultimate widescreen movie experience.



The VM40 includes just as many ports as most full-size desktop systems.



For more information on the VivoPC VM40, scan the above QR code with your phone or tablet, or visit www.asus.com/au/ASUS_VivoPC/VivoPC_VM40B.



hand, either on the table or in the air. It can also be used as a normal mouse, thanks to a 1,200dpi optical sensor and a clickable touchpad. With a 2.4GHz wireless link and the ability to run from one or two AA batteries, the VivoMouse is a must have accessory for your VivoPC.

ADD AN EXTERNAL OPTICAL DRIVE

While the VivoPC itself doesn't have an optical drive, playing back your DVDs is as simple as using the SDRW-08U5S-U. Blending in with your Vivo entertainment system, the optical drive has a built in stand so it can sit vertically or horizontally. At 12mm thick it's the world's thinnest DVD writer – even better it's powered by USB.

ASUS MONITORS

Featuring the same sculptured silver style as the rest of the Vivo devices, the MX299Q is the perfect media display to complete your system. With a 29-inch ultra-wide screen and a cinematic 21:9 aspect ratio, the MX299Q is how movies

are meant to be watched. It's an AH-IPS panel running at 2,560 x 1,080 pixels, giving excellent visual clarity and accurate yet vibrant colours. The wide 178 degree viewing angles make sharing the screen simple, while DisplayPort, HDMI, MHL and Dual-Link DVI ports let you connect all your devices. The monitor also has high quality Bang & Olufsen ICEpower audio built in so you don't need extra speakers. If you want a smaller 16:9 screen that still has the same style, the MX279Q is a 27-inch version.

VivoPC VC60

Need a pint-sized PC that packs a bit more punch?

If you crave more power for office or home use, ASUS also produces the VivoPC VC60. It has the same slim form factor, though is clad in dark grey. Inside it trades up to a Core i5-3210M or Core i3-3110M CPU with Intel HD Graphics 4000. It's equipped with 4GB of RAM (expandable with 2x SODIMM slots), and 500GB to 1TB of 2.5-inch hard drive storage space. With a bundle of USB plugs, and built in 802.11ac Wi-Fi, the VC60 is a powerful little desktop replacement PC. It's even got a legacy COM port for older peripherals your business might still need. For extra flexibility, it includes VESA compatibility that lets you mount it to the rear of your screen and a Kensington lock to secure this mini system on the table. It can even handle dual monitors with HDMI and Mini DisplayPort, making it perfect for home or office productivity use.



The powerful little VivoPC VC60 is perfect for business or home office use.

software

» APPS FOR ALL THE PLATFORMS BY PETER DOCKRILL & OTHER APC STAFF



Windows SOFTWARE

Google Chrome

Hands-free voice search for keen browsers and bakers.

FREE | GOOGLE | WWW.GOOGLE.COM/CHROME



Even if you're a stickler for Internet Explorer (or perhaps Firefox), for most APC readers Chrome will need no introduction, but one of the new features in Google's browser warrants another mention. Google has enabled hands-free Google Voice Search in Chrome Beta on the desktop, meaning no clicking is required to activate a search — convenient for either brevity's sake or, as Google puts it, at times "when your hands are covered in flour and you need to know how many ounces are in a cup". (APC recommends measuring your ingredients carefully before you start kneading.) All you need to say is "OK, Google..." and you can commence speaking your search. It's certainly a useful functionality, but it does come with one proviso: you'll need to already be on Google.com or have opened up a new Chrome tab in order to activate the mic. From a privacy standpoint this is welcome (as it means the browser isn't snooping on you in the background the whole time), but some mouse/keyboard interaction will likely still be required in most circumstances to load the appropriate tab.



Fresh Paint

FREE | MICROSOFT | TINYURL.COM/NA9XE8C

Ah, Microsoft Paint. Generations of Windows users will have utilised Microsoft's humble image creator/editor at some point over the years, but if you'd like to take things beyond crude stick figures, give Fresh Paint a try. Free for Windows 8/8.1 users, Fresh Paint is still a pretty basic drawing app, but one with a decidedly more artsy bent, giving you virtual oils and watercolours in order to produce more organic-looking, hand- or finger-painted images. Fun for little kids (or big kids), and includes lots of guides, templates plus sharing features.



Microsoft "Project Siena"

FREE | MICROSOFT | TINYURL.COM/K5WWXW3

Want to make your own app? Of course you do! After all, why not? It seems everybody else is doing it! Microsoft's mysterious-sounding "Project Siena" — the inverted commas indicate we're still looking at a non-final product — is designed to let anybody make simple apps for Windows easily, even if they don't have any previous experience with programming. The kinds of apps Microsoft suggests Siena is suitable for are business apps that utilise your pre-existing data (such as spreadsheet data in Excel, for example, or imagery you've got on hand) to fill out catalogues, populate surveys, calculate health costs or even teach card games. It's totally free, and you'll find plenty of documentation to walk you through the process at tinyurl.com/qcjqvy9. Looking at the parlous state of the Windows 8/8.1 Store — which already has a nasty case of vapour-ware in effect — we're not altogether sure a deluge of amateur app efforts will improve things for the platform, but that's not the point of "Project Siena". It's designed to let people execute their app ideas, and if it can solve people's needs and get regular users interested in some de facto programming at the same time, that can't be a bad thing, can it?



Mac » APPS

X-Mirage

Bring the convenience of AirPlay to your Mac.

US\$16 | X-MIRAGE | WWW.X-MIRAGE.COM



With AirPlay, you can connect an iOS device to an Apple TV and enjoy what's happening on your tablet screen on a much larger HD TV. But not all of us have an Apple TV. Some people might even be using a Mac mini as a media center, and despite the fact that Apple makes Macs, AirPlay doesn't allow you to stream your iOS devices to them.

Thankfully, third-party developers saw an opportunity. X-Mirage is the latest app to offer this feature, and using it couldn't be easier. Once installed on your Mac, the AirPlay function becomes accessible on your iOS device and you can use it to watch films on your Mac's screen or let everyone enjoy the game you're playing. Obviously, this offers great educational opportunities.

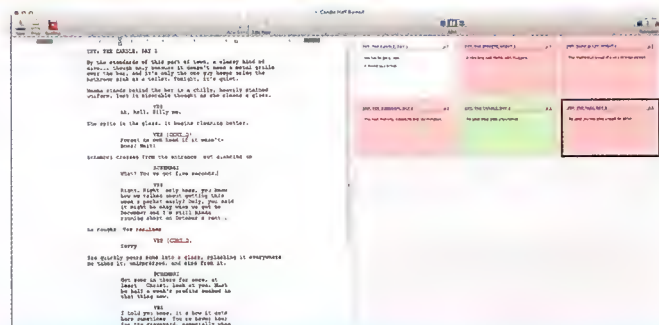
Any iPhone, iPod touch, or iPad currently on sale is compatible with AirPlay. Older models may allow you to watch a movie, but mirroring (whereby you can see whatever's on your iOS device on your Mac), may not be available to you.

A Mac, having a much beefier central processing unit than an Apple TV, offers features that wouldn't be available otherwise, like being able to connect multiple iOS devices to a single Mac. The process is incredibly simple: just connect your devices via AirPlay and they'll all appear in a long row across your Mac's screen. The more devices, the beefier your Mac will need to be in order to see them all in real time.

X-Mirage also has the option to password-protect itself so that only the devices you allow will be able to connect — useful for offices or multi-iOS households. Another great feature is the ability to record your iOS screen: a big record button appears over the window as you mouse over it. You can record multiple screens at the same time, but again, this will seriously tax your Mac's processor and lead to dropped frames if it isn't powerful enough. But being able to record whatever action you perform on your iOS device is a fantastic addition for anyone wishing to create iOS-based video tutorials.

The bottom line? If you've been looking for a way to display one or more iOS screens on your Mac, and record them all in real time, then X-Mirage will be a vital addition to your workflow. Since you can download a seven-day trial version to see if it meets your needs, you haven't got anything to lose by taking it for a spin.

Steve Paris



Final Draft 9

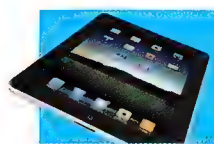
US\$250 | FINAL DRAFT INC. | FINALDRAFT.COM

Final Draft is one of those tools that's not simply an option, but the standard. If you're a screenwriter, you use Final Draft. It's a tool that doesn't simply lay out dialogue in industry-approved ways, but is at your side at every step of production from slinging ideas around on a virtual corkboard to tracking the revisions of a project.

This latest version isn't a revolutionary update, but it's a worthy one, finally adding features like a distraction-free full-screen mode that still allows access to floating info panels, jumping around between scenes, and making/acting on notes. It's also Retina compatible, and embeds OS X's dictation for hands-free scripting. Not much had to be changed though, and while it's not the slickest app, it's one whose menus hold everything needed to get a script from idea to production (aside, sadly, from a contract).

While Final Draft provides all the features a screenwriter could want, it's likely overkill if you're not currently working on the front-lines. Slugline offers a cheaper, easier way to bang out a script, while Scrivener's built-in script function can cover most bases. For professional scriptwriting, though, and the many production complexities that go with it, Final Draft continues to be the king of the genre.

Richard Cobbett



App Store » iOS APPS

Tadaa SLR

Digital snake oil it may be... but can you tell the difference?

\$1.99 | MENSCHMASCHINE | TINYURL.COM/K9VKFAJ



Run a quick search for 'SLR' in the App Store and you'll dig up a few hundred entries. Now, in fairness, some of these are guides to teach you the ins and outs of SLR photography, but the rest of them are camera apps, brazen camera apps that shamelessly promise to turn your humble iPhone camera into an impromptu SLR/DSLR. Sadly, it's a sham. As good as the iPhone camera is — and every year it gets better — it will never be able to replace, match or even get close to the image control and quality of a real SLR camera and lens setup. But what it can do is employ the magic of digital photo editing, transforming images to the point where a lot of people won't be able to immediately tell the difference. Among these \$2 shortcut apps, Tadaa SLR has the most well-executed interface and feature set we've seen. After you've taken your shot or uploaded an image from your camera roll, Tadaa fakes the depth of field effect a real SLR lens produces by having you 'paint' the

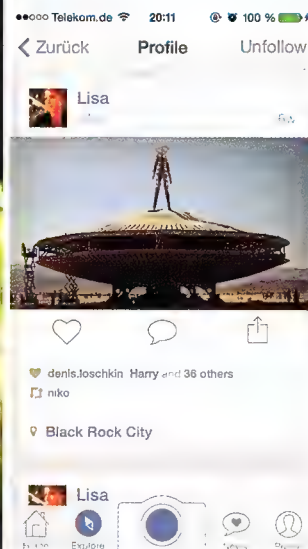
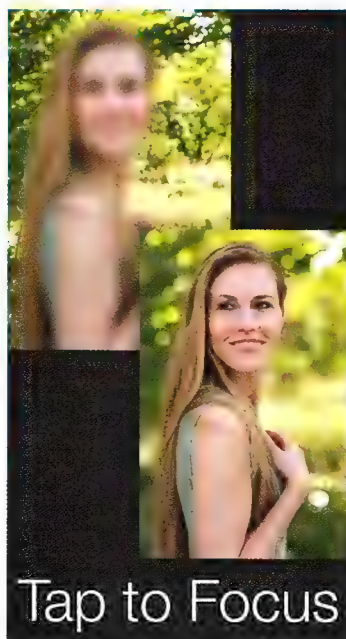
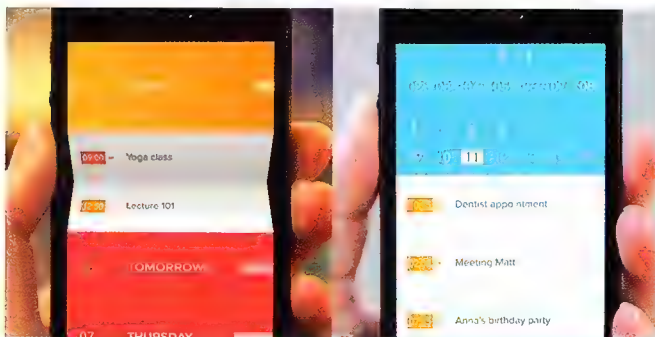


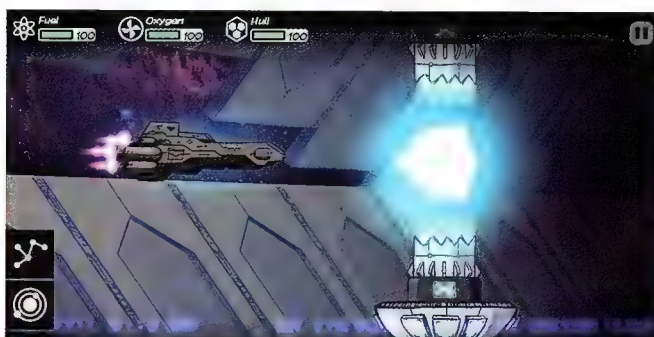
photo subject with your finger. Other apps have done this before, but Tadaa provides very crisp auto-recognition of the areas you touch. Then you can customise the intensity of the effect with a number of manual controls, reverse the focus for fun, add filters, adjust contrast and so on, plus share to social networks as you see fit. Again, it's not an SLR, but for \$2 it's not a bad con.



Peek Calendar

\$1.99 | SQUARE MOUNTAINS | TINYURL.COM/L6SBCWE

The smartphone boom has necessitated a radical rethink in the software industry, requiring the interfaces of traditional desktop PC apps (designed to fill a monitor) to be squeezed down into a space the size of a playing card. Calendar apps, which are quite visually complex and finicky beasts, have had their work cut out for them in this transition, but we've seen some successes (like Fantastical). Another winner is Peek, which adopts the sleek lines of productivity app Clear to provide a minimalist, 'essentials only' agenda for the user who values simplicity and playfulness in their time management. The thrifty approach won't suit everybody, but if you need a lightweight calendar it'll more than do — and is even rather enjoyable.



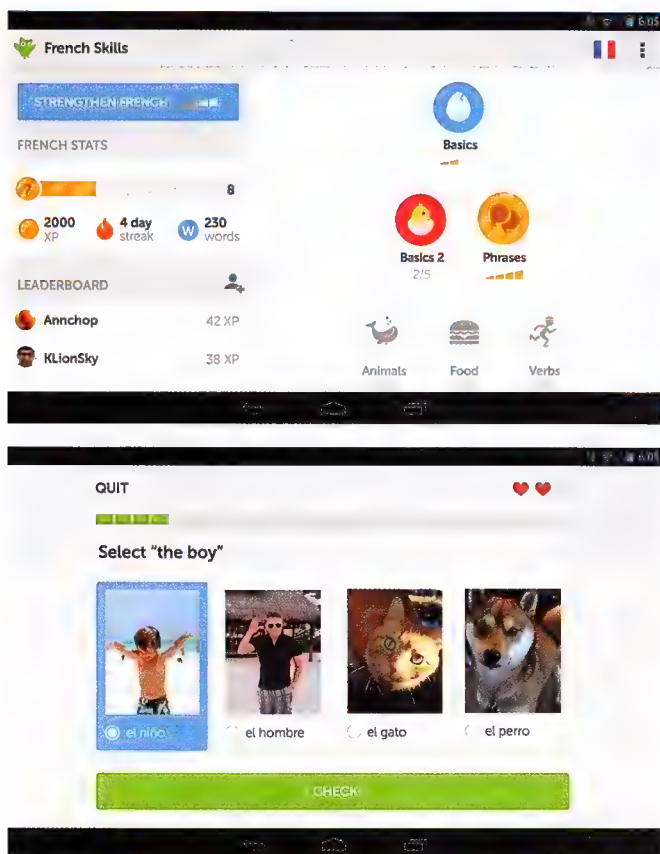
Out There

\$4.49 | MI CLOS STUDIO | TINYURL.COM/OUJKTGM

What's out there? You're going to find out. As an astronaut who wakes up in the deepest, darkest reaches of space after a cryo-stasis sleep goes wrong, it's up to you to find your way home, mining minerals and salvaging equipment to keep your humble starship in one piece along the way. With lush visuals and atmospheric styling that makes you feel like you're the lonesome hero of a cult '70s sci-fi comic book (a vibe unintentionally enhanced by a hit-and-miss English translation), this slow-burn survival sim makes for some memorable space driftin'. Resource management is the name of the game — and every little bit counts, folks. Waste not, want not.



Google Play » ANDROID



Duolingo

Fancy learning another language?

FREE | DUOLINGO | TINYURL.COM/NEKHKT5



Learning another language isn't always fun. Most of us probably remember high-school lessons where we were obliged to repeat obscure phrases *ad nauseam* in languages we may never have wished to learn... but Duolingo makes adopting another tongue fun. This enjoyable free app — also available on iOS — offers a number of European languages (Spanish, French, German, Portuguese, Italian and English) and turns the learning aspect into a game, where you can choose your skill level, trying not to lose too many hearts as you proceed through lessons and unlocking achievements as you go. In fairness, it's really not very different to school-based lessons, but the ability to choose a language that interests you — and to learn at your own, chosen pace — makes for an enjoyable and remarkable free educational tool. How can it be free, you wonder? Strange though it may sound, Duolingo actually turns its students into unpaid translators behind the scenes, with your lessons, whether beginner or advanced, actually multi-tasking as a free translation checker for multi-lingual text on the web.



Opera Max beta

FREE | OPERA SOFTWARE | TINYURL.COM/QJTJT5D

Chrome and Firefox might get all the headlines, but one of the mainstays that has been pioneering browser technology since those apps were knee-high to a grasshopper is Opera, which has always enjoyed a small but dedicated fanbase across PCs (and now mobile devices too). One of Opera's most significant innovations has been to do with in-browser compression delivered via Opera's back-end servers, meaning the pages you load consume less data on your device. The benefits are two-fold: firstly, since you're using less data at your end, the web pages you load should load quicker; secondly, less data means you won't hit your quota as quickly, and could save you money (especially on mobile data). Opera has now brought the same concept to theoretically all of Android via Opera Max, which when installed will perform the same compression hoodoo for all your other apps: Twitter, Facebook, YouTube, you name it. A ground-breaking app, but there's just one catch: the beta is USA and Europe only for now. Here's hoping a local release isn't far off.



Cover beta

FREE | COVER | TINYURL.COM/P2F7CF8

One of the things we love about Android is how open it is: an opportunity neatly exploited by Cover, which markets itself as a smart lockscreen app, but it's really a lot more than that. Cover learns which apps you use the most, plus when and where you use them. So the interface can present to you only the app icons you're most likely to need at a given location, like home (TV guide, Facebook), work (LinkedIn, email) or in the car (maps, music player) and so on, kind of like Google Now but limited solely to the programs you use. Plus it's got a nifty 'peek' functionality (copied from BlackBerry 10) which lets you glimpse apps before fully opening them. Very smooth indeed.



Windows Store » WIN PHONE 8

Cortana

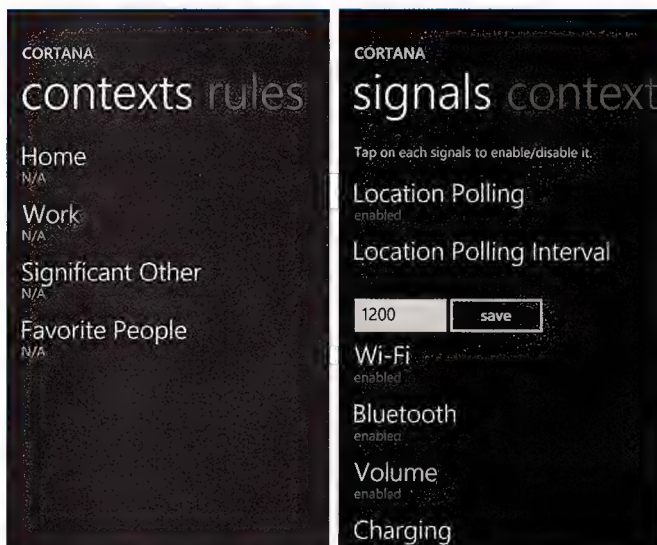
Microsoft's Siri alternative isn't far off now.

\$TBA | MICROSOFT | N/A



Xbox and PC gamers should already be familiar with the name Cortana. As the fictional AI identity in the mega-selling *Halo* shooter franchise, Cortana proved to be a versatile and able assistant, so what better codename for Microsoft to pick for its personal assistant app set to take on the likes of the iPhone's Siri and Google Now? Details about Microsoft's voice-controlled helper first leaked last year, but with the Windows Phone 8.1 update getting ever closer, new information on the digital assistant has come to light. According to reports, Cortana adopts an approach that marries the functionality of its rivals: conversational abilities and a personal flair to mimic Siri's vibe of an actual identity, while contextual awareness pertaining to the user's location/time will offer Google Now style alerts and notifications.

One of Cortana's key features is the use of a 'notebook', in which the assistant records user information gleaned from

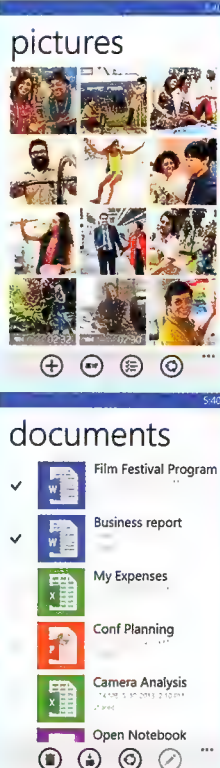


core Microsoft services (like mail and calendar), but also possibly from third-party apps that will be able to plug into the system. Despite the Cortana codename and its *Halo* background, it's unknown whether Microsoft will stick with a female character concept or adopt a more gender-neutral service like Google Now in the long run. Other additions expected in the Windows Phone 8.1 update include a long-awaited notification system, plus new media controls, search features and more. Microsoft is expected to officially unveil Cortana in early April, so we won't have too long to wait to find out more.

OneDrive

FREE | MICROSOFT | TINYURL.COM/LAPVKCS

Microsoft recently changed the name of its cloud storage offering, rebranding for legal and marketing purposes to the decidedly singular-sounding OneDrive, which it says is the "one place for your most important stuff" like photos, videos and documents. (You know, like Dropbox or iCloud.) Well, we can't argue with the value proposition, but the company's endless legacy of changing names and features in this category — OneDrive, formerly known as SkyDrive, Windows Live SkyDrive, Windows Live Folders and so on... — is almost farcical, and must be a confusing deterrent to the mainstream folk Microsoft hopes to attract. Which is unfortunate, because for WP users OneDrive is the slickest official storage option available on the platform, now including incentives to top up your storage for every friend you bring along.



Facebook Messenger

FREE | FACEBOOK | TINYURL.COM/KD7MFGV

All the hubbub around Facebook at the moment might concern its purchase of messaging giant WhatsApp (which cost an appropriately gigantic US\$19 billion), but Facebook's own messaging platform hasn't been forgotten about... yet. Facebook Messenger just made its official debut on Windows Phone with the assistance of Microsoft, giving users a standalone app for chat, group chat, photo sharing and let's not forget those all-important stickers! The Windows Phone version is trailing behind its iOS and Android counterparts a little in terms of some other features, but we don't expect it will take too long to catch up. ■



4K MILITARY GRADE GAMING UNLEASHED



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WWW.ORIGINPC.COM.AU/BATTLEBOX



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BATMAN
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CALL OF DUTY
GHOSTS

NVIDIA
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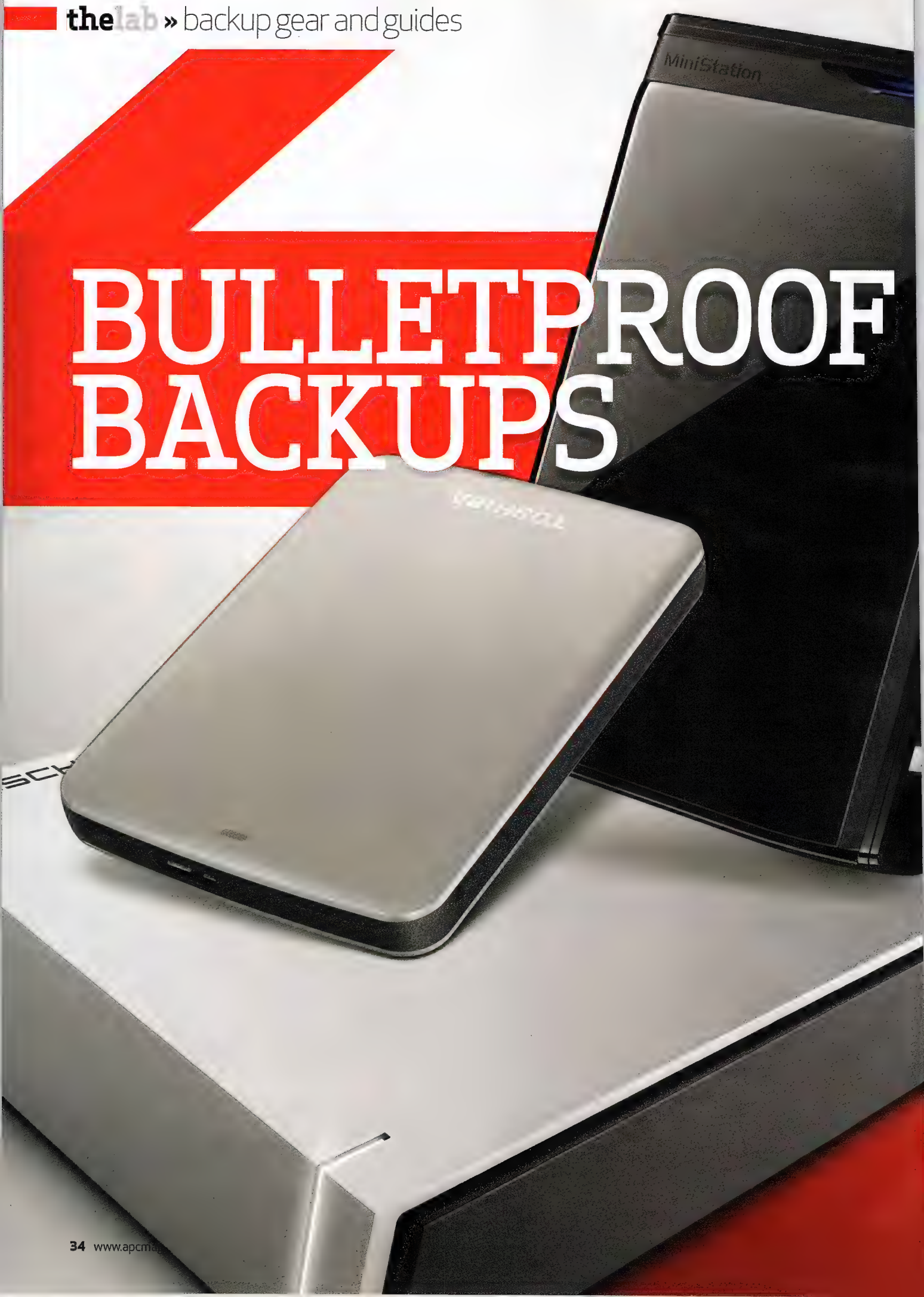
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Call it a no-brainer, call it a bland platitude, or call it a cliché – no matter which way you slice it, it's not particularly newsworthy to say that backing up important data is something we should all be doing. Yet many of us – dare we say most of us – just don't have a good backup plan. And in an age where we're increasingly storing (and living) our lives in the digital realm, that's ultimately a recipe for disaster.

So why is it that even the most tech-savvy of us don't have our backups sorted? For many, it'll be that we don't give it much thought. It's only once you've been burned by epic data loss, that you're likely to start backing up. For others, it may be that it just seems too hard. Yet, when it comes down to it, backing up doesn't need to be a painful experience, and there are now a heap of different methods you can employ to do it – genuinely, there's something that'll suit everyone. These are your options, roughly in order of the level of protection they offer:

SECONDARY HARD DRIVE

Backing up your files to a second, internal hard drive is one of the simplest. Grab an app like SyncBack Free (tinyurl.com/3qty5) set it to shuffle your critical files over at set intervals (or even on the fly) and you've got a fairly effortless solution. The downside is that it's not for everyone – not all PCs have two hard drives in a suitable setup (it's especially rare in laptops) and not every PC user is equipped to open up their machine and install a second drive. Obviously, it also won't protect your data in the event that your whole PC or laptop is destroyed.

EXTERNAL HARD DRIVE

This is largely the same as above, with two arguable advantages – anyone can buy and plug in an external hard drive, and the ability to more-easily unplug them and take them with you (or replace them, should they fall over) gives them slightly better physical security. This option works best if you have an external hard drive that stays permanently (or near permanently) plugged into the PC it's backing up. As with the internal option, you'll also want to set up a scheduled or real-time backup using a dedicated app – and the good news is that most external hard drives now include just such software. It does vary in quality significantly, however, so we'd suggest checking out our software reviews on page 45 if you plan on using a bundled app.

NETWORK ATTACHED STORAGE

Over the last four or five years, NAS has moved from a tool for small businesses to something that we reckon every household should own. In its simplest form, a NAS is basically just an external hard drive with a network adapter

bolted on top, allowing you to access files from almost any device attached to your local area network. The key benefit here is that you can back up data from every computer in your household to a single NAS. There's now a huge variety to choose from too, from single-drive devices under \$100 to massive multi-bay units that cost upwards of \$1,000. You don't necessarily need to buy a prebuilt/standalone NAS box either – you can repurpose an old PC and use a purpose-built Linux distro (like the excellent Open Media Vault, www.openmediavault.org) to create one, which is often more flexible and powerful than off-the-shelf options.

CLOUD STORAGE

Backing up all your files to the web is, in some ways, the most bulletproof backup option around. The cloud has one major advantage over the three previous options – it's off site, so it offers the best physical security. So even if your computing devices are destroyed (by the likes of fire, flood or electrical surge) you should still be able to log on with another device to retrieve your data. But while the likes of Dropbox, Google Drive and Microsoft OneDrive (nee SkyDrive) offer decent solutions for keeping your frequently-accessed files on hand, what do you do if you want to backup 100s or 1,000s of gigs of data? That's where dedicated cloud backup services come onto the scene, which are set up for just this purpose. We've reviewed a range of services as part of our guide this month.

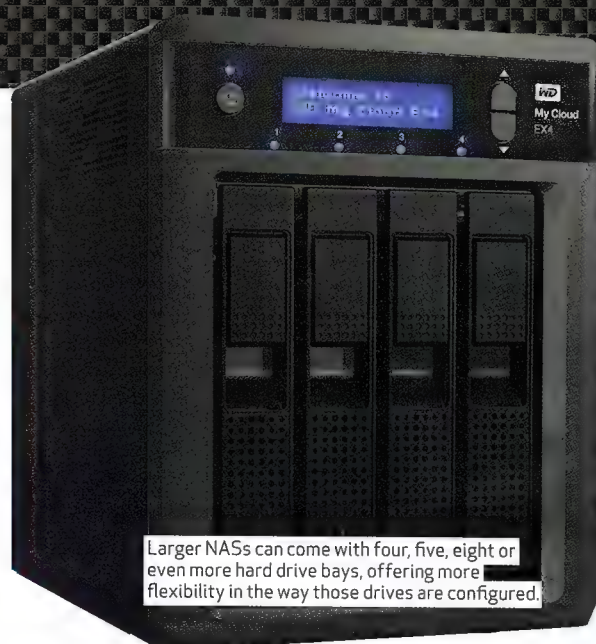
You can basically mix and match all of the above methods so that you've got more than one level of redundancy to your backups – and we'd ideally recommend having at least two. The ideal set up is to use a combination of options 3 and 4 – storing data on a NAS in a fashion that makes it accessible to most devices on your LAN, but also having an off-site backup of your most critical files (at the least) in case the worst happens.

If you want the ultimate in data protection, you may want to consider adding an uninterruptable power supply (UPS) to your setup too – these effectively act as a backup battery for any PC or NAS, letting them stay on for a certain period of time even if the mains power goes out. We've reviewed seven low-cost UPS models this month – some under \$100, and therefore perfect for home users.

The most important thing to remember about backups is this: if there's only one copy of your data, that's not a backup. You should never rely on just one device or service to hold your data – the idea of a backup is to have at least two copies of your files in the case that one of them fails. So no matter which of the above you choose, if you keep that rule in mind you really can't go wrong.

The robust backup option

A network attached, multi-drive array may sound like an elaborate backup solution, but network attached storage has it all: security, redundancy, versatility and ease of access. Nathan Taylor tests 11 models, starting from just \$150.



Larger NASs can come with four, five, eight or even more hard drive bays, offering more flexibility in the way those drives are configured.

We love network attached storage. As backup targets, as media servers, as hubs of home media content they are straight up awesome. It's the kind of product that once you have one, you can never go back. Need to back up your PC? Boom, the NAS is right there, no need for anything else. Want to watch that movie you just downloaded on the big screen or on your mobile? Just dump it on your NAS and wander over to your DLNA TV, PlayStation or Xbox and watch it or fire up your NAS's mobile app. You don't have to constantly worry about where they are, about whether your data is safe or about plugging them in when a backup is scheduled: you just set them up once and put them in a corner to do their thing.

What's more, they're doubly good as backup targets when you set them up for redundancy. NASs with two hard drives or more installed can have some of those drives set up for fault-tolerance. If a hard drive dies (and they all do, eventually), you won't lose your data and you can simply replace the faulty hard drive and carry on.

If you were burned by the early days of NAS technology, where prices were ridiculous and devices were powered by hamster wheels that could barely manage 10MB/s over Gigabit Ethernet, it's time to try again. We've looked at a range of two-bay and four-bay NAS devices, some as low as \$150, and even the cheapest models can deliver the kind of performance that would have been a miracle even five years ago.

ALL ABOUT RAID

For those of you who are new to NASs and multi-drive arrangements, it's time for a quick lesson on RAID.

RAID is short for redundant array of inexpensive disks, and you'll need to know a little bit about it when you set your NAS up. Don't worry, it's not as scary as it sounds, and the availability of RAID is actually what makes NASs

so awesome as a backup option. With a secure RAID setup, one failed hard drive is not going to ruin your month.

RAID arranges multiple hard drives into a single "array". From an outside perspective, the array will appear as a

"If you were burned by the early days of NAS technology, where prices were ridiculous and devices were powered by hamster wheels that could barely manage 10MB/s over Gigabit Ethernet, it's time to try again."

How we tested

We put the NASs through their paces.

For the sake of consistency, we have tested all the NAS devices here using the exact same method as the external hard drives on page 44. All the tests were performed using a Dataram RAM drive on a Core i5 PC with 12GB of memory as a source, and were performed across a single-switched Gigabit Ethernet network.

There are four tests: a 2GB file write then read, followed by a copy of 450GB of small files, 17,000 in total. The large file read and write speeds tell us what kinds of sustained file copy speeds are possible with the NAS. The small file tests tell us how it handles a large number of small writes.

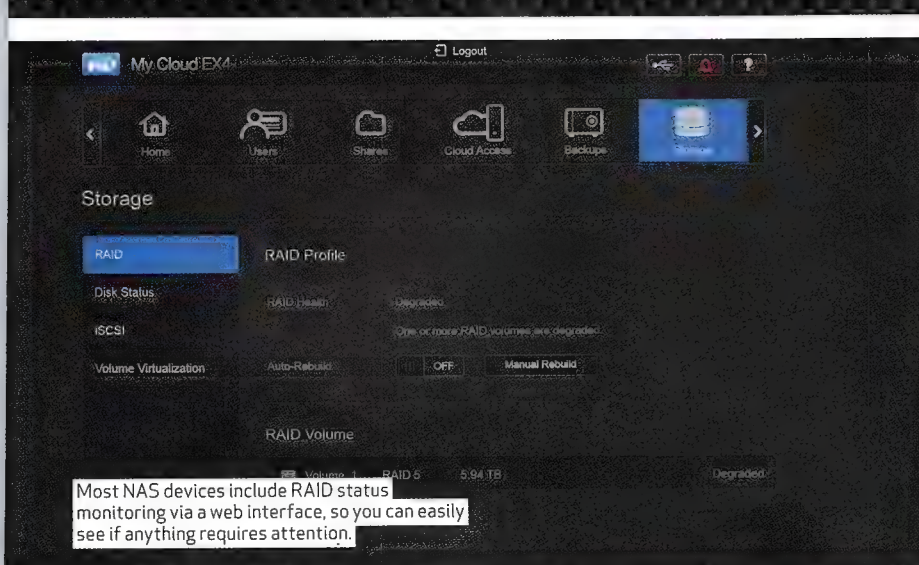
There are a few important notes to take into account when it comes to NAS tests. The first is that the tests on the two-bay NAS devices were performed on a RAID 0+1

array, while the tests on four-bay devices were performed in RAID-5. We decided to focus on use cases, and we'd assume that most two-bay users will use RAID 1, while RAID 5 would be the choice for most four-bay owners.

As a result, the write speed results of the four-bay and two-bay NASs are not directly comparable, since RAID 5 requires the NAS to calculate and write parity info to the drives.

Secondly, some of the NASs came with hard drives installed, some did not. In cases where no hard drives were bundled with the NAS, we used two or three 4TB NAS HDDs kindly provided by Seagate for the review.

In instances where this has happened, we have put a star (*) next to the name of the device in the results table. NASs that did not come with drives will also have (driveless) next to their price.



Most NAS devices include RAID status monitoring via a web interface, so you can easily see if anything requires attention.

single drive. So if your NAS has four hard drives installed in it, your NAS can arrange them to look and work like a single super-large drive.

There's actually a number of ways it can do this, and this is why it's important to know a little bit about RAID. It can set up the drives for maximum performance, or it can configure them for maximum data security. The choice is yours.

From a practical standpoint, you typically have four RAID options on a consumer NAS:

1 JBOD. Just a bunch of disks. The disks are simply stacked end-to-end, combining their capacity but otherwise offering no performance or reliability benefits.

What happened to RAID 2,3 and 4?

Why is it all just 0s and 5s?

RAIDs 2,3 and 4 are a thing, but you'll almost never hear about them. There's good reason: RAID 5 offers a superior parity solution to all of them. Where RAID 5 uses distributed parity for fault tolerance (so parity information is spread across all the drives in the array), RAID 2, 3 and 4 use a dedicated parity drive that can create performance imbalances.

On the primary drives, all three use drive striping similar to RAID 0. In RAID 2, the primary drives must have synchronous spin, and the data is interleaved by the bit (one bit on drive one, then one bit on drive two and so on). RAID 3 is very similar to 2, but uses byte-level interleaving. RAID 4 is the same again, but uses block-level striping.

Oh, and there's also a RAID 6, which is used, but only in systems with more than four drives. RAID 6 is like 5, but with double parity. That is, two drives can die without any data loss, but you also lose the capacity of those two drives.

Small files transfer speed

TWO-BAY NAS	WRITE (MB/S)	READ (MB/S)
D-LINK SHARECENTER CLOUD STORAGE DNS327L *	13.9	9.3
NETGEAR RN102 *	11.6	8.1
QNAP TS-220 *	13	10.9
SEAGATE BUSINESS STORAGE 2-BAY NAS (8TB)	14.4	11.8
SHUTTLE OMNINAS KD22 *	17.3	14.3
THECUS INTELLIGENT NAS N2560 *	18.3	16
WESTERN DIGITAL MY CLOUD EX2 (4TB)	14.2	9.6
DESKTOP DRIVES		
D-LINK SHARECENTER CLOUD STORAGE DNS345 *	18.2	24.3
QNAP TS-470 PRO *	29.6	31.5
SYNOLOGY DISKSTATION DS414 *	26.4	28.2
WESTERN DIGITAL MY CLOUD EX4 (8TB)	19.6	20.7

Large file transfer speed

PORTABLE DRIVES	WRITE (MB/S)	READ (MB/S)
D-LINK SHARECENTER CLOUD STORAGE DNS327L *	78.9	93.1
NETGEAR RN102 *	59.2	77.9
QNAP TS-220 *	72.7	80.8
SEAGATE BUSINESS STORAGE 2-BAY NAS (8TB)	59.5	60.4
SHUTTLE OMNINAS KD22 *	69	93.1
THECUS INTELLIGENT NAS N2560 *	71.3	85.8
WESTERN DIGITAL MY CLOUD EX2 (4TB)	70.5	74.5
DESKTOP DRIVES		
D-LINK SHARECENTER CLOUD STORAGE DNS345 *	55.1	96.4
QNAP TS-470 PRO *	96.2	99.3
SYNOLOGY DISKSTATION DS414 *	98.6	98.9
WESTERN DIGITAL MY CLOUD EX4 (8TB)	53.1	89.7

* NAS MARKED WITH AN ASTERISK CAME DISKLESS AND WERE TESTED WITH TWO (FOR 2-BAY DEVICES) OR THREE (FOR 4-BAY), SEAGATE NAS HDD 4TB DRIVES.

The only real benefit of JBOD is that it allows you to combine drives of different sizes without losing capacity. In other RAID models, drive capacity will be boiled down to the lowest common denominator; for example, a RAID 5 array of three 3TB drives and one 1TB drive would actually treat all the drives as if they were 1TB.

2 RAID 0. Also known as striping. This gives you the full capacity of all the drives in the array, and provides performance benefits by writing across the drives in parallel. For example, a two-drive RAID 0 array would write half of a file on one drive and half on the other, and it would write on both in parallel, theoretically reducing the write and read times to as little as half. Before you say "Yay, I want that!", RAID 0 actually makes your data more susceptible to faults. If either hard drive dies, you will lose all your data.

3 RAID 1. Mirroring. Used mostly in two-drive arrays, all the data written to one drive is automatically mirrored on the other. That means if one of the drives dies, you don't lose any data. The cost is you lose the capacity of one drive. For example, two mirrored 3TB drives will only provide 3TB capacity, not 6TB.

4 RAID 5. Distributed parity. This is only useful for arrays of three or more drives. With RAID 5, parity information used for data recovery is spread across all the drives in the array. The upshot is that any one drive in the array can die and you won't lose any data. You can simply swap out the failed drive to rebuild the array. The downside is you lose the capacity of one drive; so four 3TB drives will make a RAID 5 array of 9TB instead of 12TB. Write speed is also a little slower, since the NAS has to do the maths to calculate parity and then write that extra parity information to the hard drive.

Our current preference, if you can afford it, is a four-drive array with RAID 5. It provides a good balance between data security and capacity. If you have a two drive array, it's up to you: do you want to sacrifice half of your capacity for data reliability, or do you want maximum capacity and are willing to take the risk of hardware failure?

TWO BAY NAS DEVICES

So you're not looking for much. Just a couple of bays to provide network services for backup and perhaps disk mirroring. Two-bay NAS devices have become inexpensive, easy to use and widely available, and are a great way to get started.



\$149 (DISKLESS) | WWW.DLINK.COM.AU

D-LINK SHARECENTER CLOUD STORAGE DNS-327L

A low cost, simple NAS.

Barely larger than the two drives it houses and made of super-light plastic, D-Link's ShareCenter DNS-327L is proof of the commoditisation of the NAS. It's a shamelessly inexpensive device that can bring NASs to mass market.

The hardware is simple. The top pops open for the insertion of two SATA hard drives, and there's a single USB 3.0 port and Gigabit Ethernet port at the back. Installation of the drives is easy – you just slide them into place, but later removal is less easy (as the cut on my hand can attest).

The USB port can be used to connect an external hard drive, which can be configured for backup or for additional media services. Aside from the initial rocket-like disk spin-up, the DNS-327L is very quiet.

The firmware and management is a mixed bag. Some elements, like initial drive setup, is capable, with substantial help text for beginners. Drive encryption is supported, and you can create and manage volumes

very quickly. User management is comprehensive and includes quotas and complex group management.

But there are some elements that come across as a little arcane: Multimedia shares, the FTP server and add-on management. There isn't a lot of flexibility with add-ons; unlike QNAP, Thecus and WD, you don't really have a huge range of modules to choose from.

Given the low cost of the ShareCenter, we were concerned that the performance of the NAS might be a little anemic, and for the small file test it was. But it performed very well for large file transfers – certainly good enough for most users' needs.

Verdict

A low-cost, basic NAS that's very simple to set up.





\$170 (DISKLESS) | WWW.NETGEAR.COM.AU

NETGEAR READYNAS RN102

A low cost NAS for when you just want the basics.

Where QNAP, Synology and Thecus have pursued modularity as a virtue, Netgear has decided to walk down a path closer to WD, Seagate and D-Link. This is not a box that works as every type of server you can imagine; instead it's a focussed consumer experience, built around keeping things simple and just doing the things that most people want to do. There are extra apps you can install, but nothing on the scale that QNAP or Thecus can offer.

It's a box of heavy metal, a little larger than it really needs to be but mechanically simple to install. The drives were in and the NAS was up and running in minutes. Admin is easy through the Netgear admin page. It's a little stark, but Netgear keeps most management tasks simple and direct. Volume management, user administration, automated backup (there are three USB ports for external drives), media services and most of

the other core features are very simple and direct, many boiling down to simple check-box operations.

The pre-installed features are the ones you'd find most commonly on a NAS: DLNA services, Windows file services, iTunes, FTP, syncing, backup. We particularly like the built-in antivirus scanner, a tool that will monitor all files stored for net nasties.

The performance of the Netgear was disappointing. The slowest of all the devices we tested, Netgear clearly hasn't put much effort into optimising its drive and server performance.

Verdict

It's easy to set up and manage, but offers sluggish performance and limited modularity.



\$259 (DISKLESS) | WWW.QNAP.COM

QNAP TS-220

If you love having a million options at your disposal, this is your product.

The QNAP TS-220 runs the same QTS 4.0 OS as the TS-470 reviewed later, albeit on a 1.6GHz ARM processor with 512MB of RAM (compared to 3.3GHz Core i3/2GB for the TS-470). This OS is a marvel of versatility and features, while remaining easy enough for a beginner to grasp. Among the things included in the default build are DLNA and Windows file services, mobile access to media via the QNAP app for iOS and Android, automated backup, peer to peer downloading, tools to record and manage surveillance cameras and even a TV tuner streaming tool that allows you to plug a USB TV tuner into one of the USB ports and view and manage the stream from a web browser.

But that's just what's in the box. There are hundreds of additional apps you can download, including business apps, content creation, P2P, telephony and more. The processor in this low cost NAS is modest, however, so you might not be

able to run all the tools that you might like.

The device has a similar aesthetic to Thecus' and D-Link's two-bay NASs. The Gigabit Ethernet port is complemented by two rear USB 3.0 ports and a front USB 2.0 port, as well as a pair of eSATA ports. Drive installation doesn't seem to require screws, but it looks like they're highly recommended (it makes removing the drive easier).

As with the TS-470 Pro, with the TS-220 you're not just buying a fixed-task box; you're buying a platform. No platform is more modular or boasts more features than QNAP's, and if you like to tinker or think you might want something with a few more features, the TS-220 is a winner.

Verdict

Excellent modular firmware that's easy to use and has tons of features. Pity about the screws.





\$780 (8TB), \$275 (DISKLESS) | WWW.SEAGATE.COM.AU

SEAGATE BUSINESS STORAGE 2-BAY NAS (8TB)

A NAS with a laser focus on core apps.

Although it says "Business Storage" right there in the title, the Seagate has tools to satisfy the consumer as well. There's a media server built in, a download manager and a backup system. But there's no question that the interface was built for business – it's stark, direct and has the kind of tools that a business admin would want front and centre. We're talking quotas, security, workgroups and even a Wiki server.

The NAS itself is larger than every other two-bay NAS we reviewed, verging on four-bay territory. Part of that is because of the USM storage slot. Universal Storage Module is a Seagate term for a slot into which you can insert a portable drive (like a Backup Plus USB drive) for fast access. If you want to do things the old fashion way, there are also two USB 3.0 ports – one front and one back. It also has twin Gigabit Ethernet ports for failover and multi-LAN support. A far too noisy fan keeps it all cool.

Like WD, Seagate has taken the minimal approach to add-ons. And in this case, by minimalist we mean none. This is not a device you tinker with – it's built for the core business of serving files and not much else. Even its media services are minimalist: you just turn it on and go to the folder shares to enable it for specific folders.

It's not a fast NAS – it competed with Netgear for slowest in test, though it did OK in the small file tests – and it's not highly modular. But it's simple, built for business with a few tools for consumers thrown in. If you're looking for frills, this isn't the NAS for you; if you want focus, it's not a bad option to consider.

Verdict

It's a big, heavy unit, but it's focussed and easy to manage.



\$225 (DISKLESS) | AU.SHUTTLE.COM

SHUTTLE OMNINAS KD22

A vanilla NAS with wireless support.

Shuttle is a company perhaps best known for its home theatre PC case designs, and some of that design heritage is clearly evident in the smooth brushed metal of the casing, the front-facing USB 2.0 ports and the flash memory port. It's also evident in the need to use a Phillips-head screw driver to mount drives, and in the lack of useful diagnostic lights on the front of the case.

The firmware could also use a little tweaking. Using the supplied software, we walked through the setup wizard, which weirdly just stopped working at one point. Then we tried the web admin, and again we were taken to the wizard; which did not like Firefox. Finally we fired it up in IE and got it working.

The setup, once you can get it running is fairly straightforward, as is ongoing administration of the Shuttle. It's fair to say that's at least partially because there's not that much to it. The Omninas supports DLNA, Windows

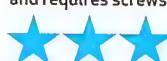
File sharing and HTTP access of files, but all are largely on-off operations with immutable defaults. There's also a backup to attached USB tool and a cloud service, again, both very basic.

It's here you'll also find the wireless network configuration for the Omninas. The KD22 is a rare NAS with wireless support, supporting up to 802.11n (sadly, no ac).

Although we found its firmware rather lacklustre, for file operations the Shuttle was more than adequate. In particular it delivered large files quickly and smoothly. What's more, the NAS made nary a sound while in use, which is always a bonus.

Verdict

It has very good transfer speeds, is wireless, but has limited firmware and requires screws.





\$269 (DISKLESS) | WWW.THECUS.COM

THECUS INTELLIGENT NAS N2560

More like a compact PC than a NAS.

A diskless NAS in iPod white, the Thecus N2560 did not make a good first impression. The plastic casing feels thin and cheap, and installing the hard drives was not a process that filled us with confidence. Although the installation was conveniently screwless, the seating of the hard drives was loose with a pronounced jiggle as we moved the drives, which were only held in by a snappable piece of plastic.

However, once it was set up, we quickly found it was not without its virtues. Perhaps most unusually, the Thecus includes an HDMI output port, allowing you to directly connect the device to your screen. Combined with a keyboard and mouse attached to the two USB 2.0 and one USB 3.0 ports, you can actually use the N2560 as a decent media player. Yes, it can play video files directly, and thanks to its modular support for XBMC it plays a wide range file types.

There's actually some pretty impressive hardware

in the box too. It runs on an Intel Atom SoC CE5335 processor with 2GB of RAM, a chip that draws very little power – 14W under load – and requires very little cooling, making it very quiet. It managed to deliver impressive performance numbers for file operations, too, among the better of the two-drive devices we tested.

Thecus firmware should also prove to be a boon to tinkerers. Essentially a modified version of Linux, it's versatile, feature-rich and modular. Although it looks a little dated, there's no denying that the firmware ticks every feature box. There are tons of server apps built in and more available as modules that are fully fledged applications in their own right.

Verdict

Hardware feels a little cheap, but it's highly configurable with HDMI out and XBMC available.



\$TBA | WWW.WD.COM

WESTERN DIGITAL MY CLOUD EX2 (4TB)

As consumer-friendly as can be.

The newest product in WD's NAS range (it wasn't out when we got our hands on it), the WD EX2 looks like an obese version of WD's My Book line of USB hard drives. But don't let its simple design deceive you: the My Cloud EX2 possesses so many of the excellent features that made the EX4 our top pick of the four-bay NASs.

The model we looked at came with twin 4TB drives installed, but those could be easily swapped at a later date using the clever screwless top-loading system. It doesn't have the handy LED of the EX4, but it does possess two USB 3.0 host ports. There are tools in the firmware to manage these drive, including providing media services from them and for automated scheduled backup from the EX2 to the drives.

It's in the firmware that the EX2 really shines, however. It boasts identical firmware to that found in the EX4, and it's some of the friendliest we've seen for a consumer NAS. Setting up cloud shares for mobiles,

Windows file sharing or DLNA is extremely easy. So is creating volumes, encrypting drives, setting user access controls, configuring automated backups and even independent downloading of BitTorrents. There are also excellent visual diagnostics. It's firmware that's not as configurable as some of its competition, but there are a handful of add-on apps you can download for media serving as well as content creation.

We found the performance of the device a tad disappointing – especially the small file read speed, which got bogged down for no reason we could discern – but it's more than adequate for most uses.

Verdict

It's easy to set up and use with first-rate firmware and all the services a consumer could want.



FOUR-BAY NASs

While they're rather more expensive, four-bay NAS devices have a major advantage over two-bay devices: storage efficiency. With a two-bay NAS, if you want data redundancy in case of disk failure, you have to sacrifice half of your total capacity. On a four-bay NAS, you only need to give up 25%. Of course, let's face — with all the media you're probably downloading, two drives just wasn't going to cut it anyway.



\$299 (DISKLESS) | WWW.DLINK.COM.AU

D-LINK SHARECENTER CLOUD STORAGE DNS-345

A middle-of-the-road NAS.

The four-bay counterpart to D-Link's DNS327L, the DNS345 shares a similar set of advantages and pitfalls. On the positive side, it's affordable, its basic setup is easy, and it has a very convenient LED display on the front with status information. On the other side of the ledger, however, are some half thought-out implementations of common features and a general lack of modularity.

It's an attractive beast of brush black metal with an installation that requires a little brute force but does not require the services of a screwdriver.

Conveniently the front LED display shows its current IP address, sparing you the need to run any software on your PC. It will also tell you volume usage and current internal temperature.

The firmware in use is identical to that of the DNS327L. It's firmware that has excellent step-by-step wizards for basic setup, including RAID creation,

volume management and user management, but the same can't be said for some of its ancillary features like the Surveillance Center, media services, peer to peer downloading, cloud services for mobile devices and FTP.

There's a single USB 3.0 port on the back, into which you can plug an external drive, and there are tools built into the D-Link to support automated backup to that drive. It also supports printer sharing on that port.

All up, it's a middle of the road effort from D-Link. We really like the case design and information display on the front, and the basic setup is smooth. But some of its features still need a little work.

Verdict

A very nice case design with easy initial setup although the firmware is a bit of a mixed bag.



\$1,349 (DISKLESS) | WWW.QNAP.COM

QNAP TS-470 PRO

Awesomely modular, crazy fast and beautifully designed.

For the tinkerer, the QNAP TS-470 Pro is awesome. You can download hundreds of additional apps for it on top of the extensive default suite. It comes with the usual Windows file sharing and DLNA, as well as automated backup to external drives or cloud services, sharing of photos, videos and music to mobiles with QNAP's mobile app and an excellent surveillance manager for recording and monitoring surveillance camera feeds. But that's just the tip of the iceberg: you can manually install proxy caches, IP telephony servers, database servers, CMSs, presence and IM servers, home automation controllers and much more.

In spite of its many options, the initial setup is quite easy thanks to a setup wizard. You can set it up as a business or consumer NAS, and it will customise its app suite accordingly. Once setup, admin complexity roughly corresponds to the number of apps you're running.

In addition to incredibly

versatile software, the TS-470 Pro has connectivity options coming out the wazoo. There are four USB ports (two 2.0, two 3.0), two Gigabit Ethernet ports, two eSATA ports, HDMI output and audio in/out. The last two can be used to connect the TS-470 Pro directly to a monitor or TV, and there are media apps including XBMC that can be installed on it.

To top it all off, the performance of the NAS was impeccable, not even slowing down to process RAID 5 parity data. It beat every other NAS, which is not surprising given it runs on a 3.3GHz Core i3 processor and 2GB of RAM. If the WD My Cloud EX4 is our dream consumer appliance, this is our dream do-it-all server. An amazing product.

Verdict

Does everything and does it well with speed and fantastic firmware. Don't let the price scare you.





\$549 | WWW.SYNOLOGY.COM

SYNOLOGY DISKSTATION DS414

A fast NAS that's managed and runs like a PC.

A light and compact dark grey plastic box, the Synology DS414 had one of the cleanest mechanical setups of any of the NASs we tested. Screwless slide out trays made installation of the drives extremely simple.

The simplicity of the Synology does not quite extend into the software setup, however. Initial setup required us to install the firmware from a CD, a process that was neither intuitive or quick. Once the software was installed, however, the actual management of the NAS was relatively smooth, if a little complicated for newbies.

It's all done via a web page that looks and works like an actual PC desktop. There are a huge number of tools built into the default firmware, and more downloadable if you've a mind. Like QNAP and Thecus, Synology prizes modularity, and while it doesn't quite have QNAP's range of apps, it really does have some good add on tools, such as surveillance camera tools, network backup tools,

mail servers, even video transcoding. For most users, the default tools should be more than enough – even these offer a level of fine-grained configurability that most other NAS makers would do well to emulate.

The Synology put in some excellent performance numbers, although the hardware is relatively modest. There are twin Gigabit Ethernet ports, a pair of USB 3.0 ports at the rear and one USB 2.0 port on front and two huge fans to keep the entire apparatus cool (they were thankfully relatively quiet during our testing). Internally it runs on just a 1.33GHz dual-core ARM processor and 1GB of RAM and consumes up to 40W during access and 14W when idle.

Verdict

A fast, highly configurable NAS, down to the finest details.



\$1,099 | WWW.WD.COM

WESTERN DIGITAL MY CLOUD EX4 (8TB)

Close to consumer NAS perfection.

As a NAS device built for the everyday user, WD's My Cloud EX4 gets everything right. The design, interface, features and performance are all top shelf.

Part of that is because it already comes pre-configured with very good settings. The 8TB model we received came pre-formatted in RAID 5, with media services and Windows File Sharing turned on. It was essentially plug and play.

If you do need to configure it, however, the management interface is the most user friendly we've seen. It's mostly wizard-based, with excellent help to walk you through all the settings. In terms of modularity, it's nothing like the QNAP or Thecus products – but it keeps things easy and does all the things you need it to.

That includes Windows file sharing and DLNA using the excellent Twonky Server technology. There's Time Machine support, and automated cloud backup. It supports full drive encryption and works as a

cloud server for mobile devices. There's a BitTorrent downloader built in, and a small number of well designed add-ons can be loaded, including Iccast (media streaming service), WordPress and Joomla! (content management system). It has among the best firmware we've seen.

The hardware is good, too. There are twin Gigabit Ethernet ports and two USB 3.0 ports for external drives that can be set to backup to. Installing or replacing internal drives is easy. It's entirely screwless and takes seconds: simply drop down the front panel, and the old drive pops out. Slide in a new drive and you're good to go.

Although it's a little pricey, the WD gets top marks all round. Highly recommended.

Verdict

Phenomenal firmware design that's fast with a handy status LED on the front. Priced to kill.



The no-fuss backup option

If you just want to get the job done, there's no simpler solution than adding an external hard drive. Nathan Taylor tests 12 of the latest.

Network attached storage, for all its versatility, is a complex and expensive beast. Cloud storage has ongoing costs, can take forever and can gut your internet quota. But external hard drives? They're easy. You just plug them in and go. If all you want from your backup solution is a straight copy of your most important files in case everything goes to hell, no solution is more cost effective or efficient than an external hard drive.

Unless you're buying old stock for cheap or are looking to get a new fangled Thunderbolt drive, USB 3.0 drives are pretty much the standard now. All the drives reviewed below are USB 3.0, but these drives are also backwards compatible with USB 2.0 (although they will run a lot slower on a USB 2.0 connection).

TEST RESULTS

All the hard drives reviewed here were put to four tests: a 2GB large file write then read, followed by a copy of 450GB of small files, 17,000 in total. The large file read and write speeds give us an indication of the sustained file copy speeds supported by the drive; the small files speeds tell us how it copes

with the more challenging task of handling thousands of documents and other small files.

COMPARING THE SOFTWARE

Let's face it, when it comes to hardware, there's not all that much difference between one external hard drive and the next. There are so few drive manufacturers left that models from

"If all you want from your backup solution is a straight copy of your most important files in case everything goes to hell, no solution is more cost effective or efficient."

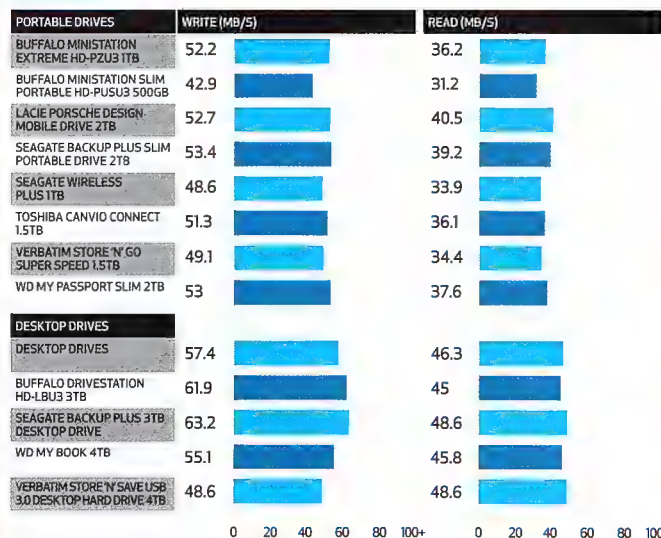
completely different drive vendors may in fact be using the same hardware internally. This is borne out in our test results: there wasn't much difference in the transfer speeds between even the fastest and slowest portable and desktop drives.

One big area of differentiation, however, is the supplied software. Pretty much every external drive

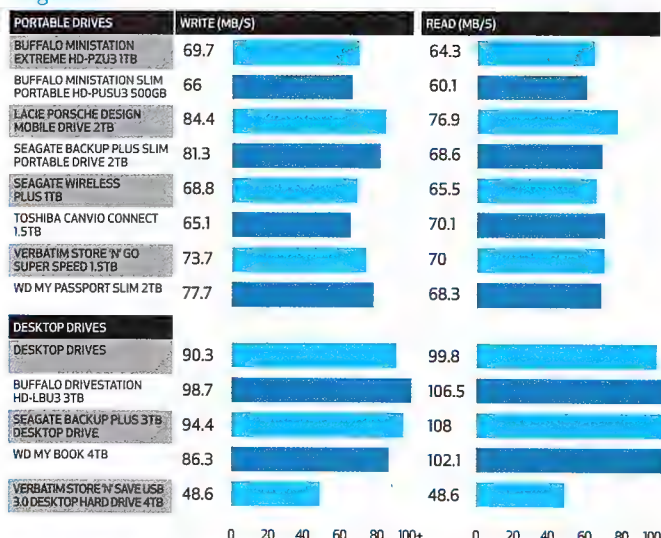
vendor bundles its hardware with a backup solution and possibly other utilities. Rather than re-review the software with every drive we look at, we thought it might be handy to take a top-level view of the major software bundles that come with external drives. If you think you might use the bundled software, this is a good place to start your decision making process.

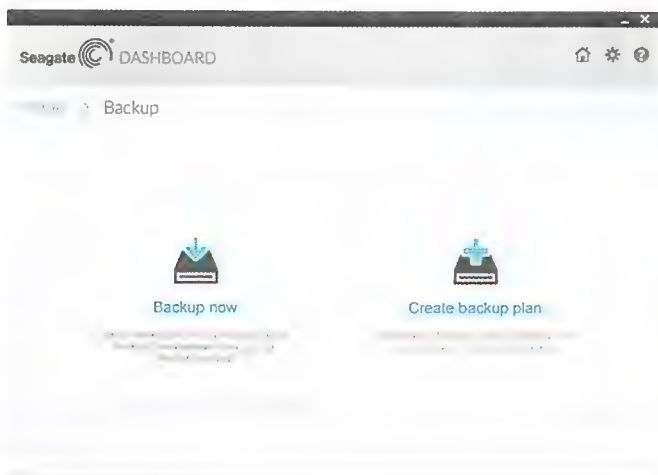


Small files



Large files





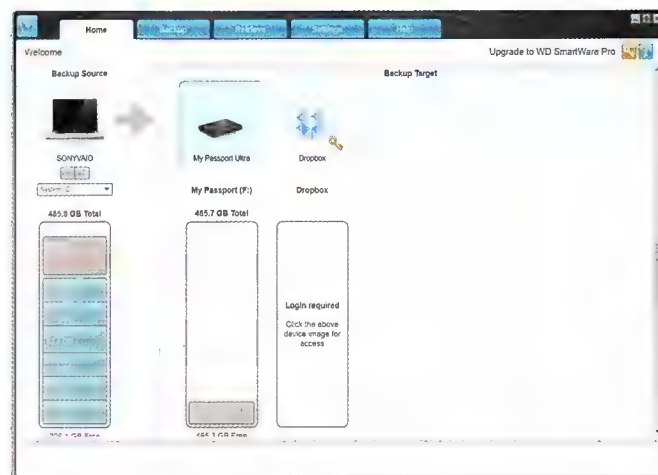
Seagate Dashboard 3.0

Rather than provide you with a suite of separate tools to install and execute, Seagate has built hooks into all of its tools into the Seagate Dashboard – and it's excellent, most especially the PC and mobile backup tools. It comes with all the new model Seagate drives, and is a major selling point for Seagate. Seagate Dashboard has three elements. The first is PC backup, which is an excellent automated backup system. Its inclusion of continuous backup (where files are backed up the moment they change) alone sets it ahead of Windows Backup, but its simplicity and speed are also a cut above. Dashboard also incorporates the mobile

backup server. Seagate provides free backup apps for iOS and Android, and they can talk to the Seagate Dashboard on your PC to transfer backup data to the drive. It's a very easy way to back up the contents of your mobile device. Third is the social function, which we're not entirely sold on. It's built to allow you to upload the contents of your external drive to social media (YouTube, FaceBook, Flickr), and conversely back up your social media posts to your drive.

Verdict

A one-stop dashboard for all of your backing up needs.



Western Digital SmartWare

Although it has been left a little behind by Seagate, WD's SmartWare remains one of the best backup tools supplied with hard drives. It comes with pretty much all WD external drives, and while it includes some drive management features, it's mostly about backup.

The great thing about SmartWare is that it gives a nice graphical view of your drive and your backups. You can tell at a glance what the capacity is, and the balance between different file types. You can choose to back-up by file type or to manually select directories. Continuous or scheduled backups are an option, there's a simple versioning tool to retrieve older versions of files and you can

even send files directly to Dropbox if you upgrade to the Pro version. While this is not a tool on par with a commercial app like Acronis True Home, for most users it should be more than enough.

WD drives with encryption also come with WD Security, a simple tool for managing security on the drives, and all drives also come with WD Drive Utilities, a set of diagnostic and management tools.

Verdict

Some drive management features, but it's mainly all about backups.



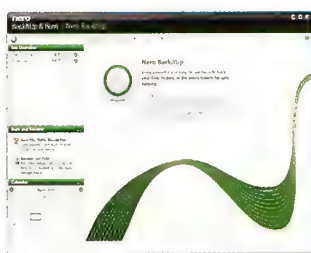
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ANDROID APP ON
Google play

"DVD mastering is good, but hopefully you're getting a portable drive so you don't have to do that anymore."

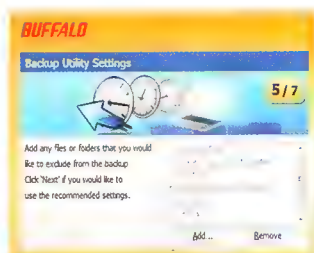


Nero BackItUp & Burn Essentials (Verbatim)

For the past few years Verbatim drives have been bundled with BackItUp & Burn Essentials from German software developer Nero. Nero is perhaps best known for its DVD mastering and burning software, which perhaps explains why a portable hard drive comes bundled with DVD burning software. DVD mastering is good, but hopefully you're getting a portable drive so you don't have to do that anymore.

The BackItUp part is where it gets interesting. Like NTI Backup Now EZ, the Essentials version of BackItUp has its rough edges. It provides more user options than WDs and Seagate's solutions, but it's less intuitive, less one-click simple and doesn't provide the same kind of continuous backup system they do. It's worth installing if you have nothing better available.

The drives also come with Nero RescueAgent, a tool for recovery of deleted files and files that have been corrupted due to hard drive damage. This one is worth the price of admission. It gets a little technical, but it's a very good last resort.

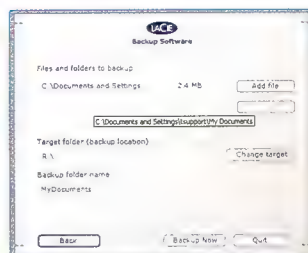


BuffaloTools

Buffalo's consumer drives are all supplied with BuffaloTools, a potpourri of utilities that you may or may not find useful. SecureLock is probably the most universally useful tool: it provides the tools you need to lock and unlock drives with hardware encryption (and Buffalo produces a few of these), and for drives without hardware encryption it can be used to apply software encryption. It's a very simple app, but it works fast.

Buffalo Backup Utility is a take-it-or-leave-it backup tool. It's very simple to use and we really like its one-click backup defaults (saving everything except the system files) but if you're looking for something sophisticated this is not it.

There's also TurboPC, a Ram Drive utility that most people will have zero use for (why is it even there?), and eco Manager, a drive power management utility the features of which are already available in Windows.



LaCie Backup Assistant and Private-Public

Like Buffalo, LaCie provides a small suite of tools with the external hard drives it ships. This includes the heavy-handed and unnecessary LaCie Desktop Manager that also incorporates eco management tools. In terms of backup, you get Automatic Backup, which is about as basic as you can imagine a backup tool to be: you follow a wizard to select a directory or directories to back up, set a schedule and then click back up. There are absolutely no frills here, which makes it simple to use, but in terms of features it is inferior to even Windows Backup.

LaCie Private-Public, on the other hand, is a really nice software drive encryption solution. It allows you to apportion parts or all of your drive to be password protected. You don't need to install anything to use it; it can be run directly from the drive itself to unlock secure segments of the drive.



NTI Backup Now EZ2 (Toshiba)

Bundled with Toshiba's Canvio portable drives, NTI Backup Now EZ2 is amongst the weakest backup solutions provided with the drives. It has its virtues — a colourful GUI, cloud support, folder-based, file type-based and full system backups — but it feels a generation behind the rest of the pack. In particular it lacks support for continual backups (although you can set hourly backups if you feel the need). Overall, we'd rank it only marginally better than the backup built into Windows.

Verdict

More user options than some others, but less intuitive.



Verdict

It's simple and works fast, but we can take it or leave it.



Verdict

Basic backup features with good encryption options.



Verdict

Feels like it's falling behind, only marginally better than Windows own backup.



PORTABLE DRIVES

There's no question that the external hard drive market is dominated by portables right now. The sheer convenience of portability and the lack of need for mains power makes them the top pick for most users. Capacities have been driven up to 2TB and prices have come down a lot.



\$135 | AU.BUFFALO-ASIA.COM

Buffalo MiniStation Extreme HD-PZU3 1TB

Hardware encryption and a built-in USB cable.

Buffalo's 230g HD-PZU3 has a few features that set it apart. The most immediately noticeable is the built in USB cable that wraps around the edge of the drive. The cable is quite stiff and way too short, so it limits the position of the drive when attached, but you can always swap it out for a more conventional cable. Less immediately noticeable but perhaps more valuable is the built-in hardware encryption. In conjunction with Buffalo's SecureLock software, it lets you password-protect the contents of your drive, so that if it's lost or stolen nobody can get their hands on your files. We actually prefer SecureLock over WD's encryption software, but the rest of the software is inferior to WD's bundle. The drive is a little pricey for a 1TB model, and the performance was solid but unspectacular. But if you want hardware encryption it's a solid choice.

Verdict

Hardware encryption, built-in USB cable, but a little heavy.



\$95 | AU.BUFFALO-ASIA.COM

Buffalo MiniStation Slim Portable HD-PUSU3 500GB

They don't get smaller than this.

So 200g is a little too much to carry around, eh? Try the 140g MiniStation Slim Portable then, an aluminium-encased drive that makes most of its competitors look positively obese. Just 8.8mm thick, the Slim Portable is roughly half as thick as most other portable drives, although it's similar to others in the other two dimensions.

Of course, shaving off drive platters to achieve its sleek profile has an effect on the drive's capacity. The drive is available only in a 500GB model right now. It also turned out to be considerably slower than most other drives in our test, but that's the kind of price you pay for staying slim and ultra-portable.

It comes with the standard set of Buffalo Tools, and in this case there's no hardware encryption.

Verdict

Just look at how skinny that thing is, and it's affordable too. But it does have a limited capacity.



\$250 | WWW.LACIE.COM.AU

LaCie Porsche Design Mobile Drive 2TB

Like its namesake: fast and stylish.

There's only so much you can do with hard drive design, but LaCie deserves credit for making its hard drives just a little more stylish than the rest. Made of solid aluminium with a wallet bar and unique activity light, the 2TB Porsche Design is about as elegant as we've seen an external drive.

But it offers more than just looks. The LaCie also managed to top our performance rankings, delivering better speeds than all the other drives in three out of four tests. Only Seagate came close.

Then there's the excellent software drive encryption tools that LaCie provides with the Porsche Design as well as a unique setup process that formats the drive specifically for your computing platform. An outstanding package.

Verdict

Sleek, stylish and as fast as they come, with good drive encryption software too.



\$200 | WWW.SEAGATE.COM

Seagate Backup Plus Slim Portable Drive 2TB

First rate software and a first-rate drive.

Seagate's portable and desktop drives have looked so much better since it did away with the GoFlex attachment. Seagate has redesigned its portables to a simple and svelte box. Weighing just 150g, they're also considerably lighter than most of the competition.

Seagate has also rebuilt its software, adding a host of new features including social and mobile backup. Right now, Seagate provides hands down the best software solution of any portable hard drive vendor. Combine that with the fair street price and excellent performance of the 2TB model we tested, and Seagate is absolutely onto a winner with the Seagate Backup Plus Slim Portable.

Verdict

Outstanding software and excellent performance.





\$220 | WWW.SEAGATE.COM

Seagate Wireless Plus 1TB

A built in wireless access point for mobile access? Yes please.

With the Wireless Plus Seagate has taken mobility to a whole new level. It built a wireless access point right in, as well as a battery capable of keeping it running independently for up to ten hours. To access it on a tablet or mobile, you'll need to first install Seagate's Media App from Google Play, the iTunes App Store or the Amazon app store. The app will let you stream media to your mobile device, and up to three devices can be accessing the Wireless Plus simultaneously. It's something that works really well in practice – although we found you do need to be in the same room as the Wireless Plus for consistent playback of video over Wi-Fi.

You can still use it as a regular old USB drive as well, which is the optimal way to get media onto it. It performs well enough; not anywhere near the fastest devices we've tested, but more than fast enough for practical purposes.

Verdict

Wireless access point built into this lightweight unit. Its weak-ish Wi-Fi signal is a let down though.



\$120 | WWW.MYTOSHIBA.COM.AU

Toshiba Canvio Connect 1.5TB

A value choice.

A simple rounded-edge design is the hallmark of Toshiba's Canvio range of portables, drives that are about as middle-of-the-road as they come. The 1.5TB Canvio Connect we tested produced middling performance across the board.

It comes with some take-it-or-leave-it backup software, and the box prominently promotes the bundled 10GB of Pogoplug Cloud storage (which the backup software can write directly to). We guess that's where the 'Connect' in the name comes from, but the reality is that 10GB of online storage is not that big of a deal anymore. Pogoplug itself offer 5GB to anybody who comes along.

The drive's greatest virtue is its per-capacity price. With 1.5TB capacity on tap, it's currently retailing at about half the price of some of the 2TB drives.

Verdict

A good value unit with a nice neat design. It's software and cloud bundle is a little vanilla.



\$135 | WWW.VERBATIM.COM.AU

Verbatim Store 'n' Go Super Speed 1.5TB

A drive with decent performance and nice design.

We're always impressed at how simple and elegant Verbatim's portable hard drive designs are. A black, flat bottomed and tapered design, the Store 'n' Go Super Speed looks like it was made to be elegantly unobtrusive, blending in with the desk or table it's placed on.

The drive delivered solid benchmarks results when we tested it, mostly near the middle of the pack, and without any alarm bells or problems. The supplied software is a little much: the Nero suite as well as an unnecessary energy management tool is a little excessive, and not all of it is worth using. Still, it's a good deal for the capacity on offer, and a drive that won't disappoint with its design.

Verdict

It has a discreet design and is supplied with recovery tools.



\$220 | WWW.WD.COM

WD My Passport Slim 2TB

A drive with the works.

A modest update for the My Passport Ultra, the new WD My Passport Slim shaves roughly 100g off the original but is otherwise nearly identical in dimensions and very similar in terms of features. The biggest change is a sleek new aluminium case and provided soft pouch which give the drive a more modern look.

As we've found previously with the Ultra, the performance of the Slim was excellent on our test system. Although differences in drive performance across the board were somewhat marginal, the Slim managed to be near the top in all of the tests.

Given its formidable performance, excellent software, built-in encryption and fair value for money, WD's My Passport Slim is a top pick right now. It's highly recommended.

Verdict

Excellent software, drive encryption and a solid performer.



DESKTOP DRIVES

It's fair to say that desktop external hard drives are something of a dying breed. The capacity of the portables has reached the point where most people don't feel the need for a desktop drive, with their attendant bulk and need for a dedicated power point. However, if you're working in video, if performance is a premium requirement or if you really need that extra one or two TB that desktops can offer, there are still a few options available for you.



\$180 | AU.BUFFALO-ASIA.COM

Buffalo DriveStation HD-LBU3 3TB

A discreet drive with solid performance.

Built into a modest and sleek chassis, Buffalo's DriveStation HD-LBU3 3TB is about as conventional as external hard drives get. There's no real frills here, nothing to set the drive apart from the pack, but it's a solid performer that gets the job done.

Like other Buffalo drives, it comes with a suite of utilities, the best of which is Secure Lock which can be used to encrypt a drive. In this case there's no hardware protection, so you're left with software encryption which requires app installation on a PC. Of course, since it's a desktop drive and weighs just shy of 1kg, you're not likely to be carrying it from PC to PC anyway.



\$140 | WWW.SEAGATE.COM

Seagate Backup Plus 3TB Desktop Drive

A drive with an excellent multi-faceted backup system and switchable interfaces.

The desktop counterpart to the portable Backup Plus drive, Seagate's Backup Plus Desktop Drive comes with the same suite of outstanding backup tools, covering backup of social media and mobile devices as well as your PC. That software is what really sets the Backup Plus drives apart, and it works just as well for a desktop drive as a portable.

The design of the drive itself is beautifully refined, and Seagate has thankfully done away with the default clip-on base adapters that made the previous GoFlex models so unattractive. However, Seagate still provide similar versatility as the GoFlex models. The drive comes with a USB 3.0 port and cable by default, but you can get adapters for FireWire and Thunderbolt similar to the GoFlex model.



\$265 | WWW.VERBATIM.COM.AU

Verbatim Store 'n' Save USB 3.0 Desktop Hard Drive 4TB

Hideous.

Where Verbatim has always managed to put out impressively designed portable drives, the same can't be said of its desktop offerings. The Store 'n' Save is a hideous grey blob, a drive that could barely be more unattractive if they tried. It's also a little expensive for what's on offer. Yes, this is equal to the largest capacity drives available right now, but neither the mediocre software bundle or decent-but-not-great performance justify the price premium over its WD and Seagate competition. This is certainly not a drive that we can recommend over the competition just now, and Verbatim either needs to lower the price or increase the value if they want this to compete with the big boys out there.



\$240 | WWW.WD.COM

WD My Book 4TB

Top-shelf performance and backup software.

If you were to ask us what is the money-is-no-object best external backup drive available, we'd have no problems recommending the WD My Book 4TB. The 3TB drives are better value for money on a cost-per-TB basis, but the 4TB My Book provides maximum speed and maximum capacity in one hit. And what's more, it comes with hardware encryption and among the very best backup and imaging solutions bundled with a hard drive. In addition to the consumer friendly SmartWare that all WD drives get, the My Book also comes with Acronis True Image, an outstanding tool for creating drive images, performing drive migrations and cloning drives. If you're looking to use the external drive as an intermediary as you move from one PC to a new PC (or if you simply want to replace the hard drive in your existing PC without having to do a complete Windows reinstall), the My Book is an excellent bet.

Verdict

Sleek design that would work well in a video lab. It's a shame about its so-so software.



Verdict

This unit offers outstanding value with excellent backup software.



Verdict

Decent performance, if you can get past its price and its looks.



Verdict

Acronis True Image is bundled with this very fast, if plain looking, device.



Safer than houses

Online backup services make sure that your files are as secure as they possibly can be. Nathan Taylor tested out six options.

So what if your house burns down? Or the thief that's stealing your computer is not so kind as to leave the external hard drive behind? If these are the kinds of questions that haunt your dreams, then an online backup solution might be for you.

Online backup services have been around for some time, and they allow you to store all your precious files in a secure, managed datacentre. They also have the advantage of making file transfers as easy as logging in on a separate computer. If you're away from home and need a file from your PC, you can always log into your online backup to grab it.

These are not syncing and sharing services, however — although they might also include sync capabilities as part of the package. While you can use SkyDrive or Dropbox as a kind of manual backup solution, they're not really built for it, and don't come with any kind of automated backup software or versioning or recovery tools. The products reviewed here, however, are built for backup and come with tools to automatically mirror your files on the online drive.

THE FIRST BACKUP IS THE HARDEST

Using an online backup solution is actually very much like using a local service. Each service provider will supply you with an application that you will have to install on all the PCs you want to back up. They may also provide links to mobile applications that allow you to access backed up files on your phone or tablet.

These applications generally look and work very much like the local backup tools you might be familiar with. Some simply do a full system backup, mirroring all the files on your hard drives to the server. Others allow you to select categories of files or choose specific folders to backup. The applications will let you set a schedule for backup, and may offer continuous backup, where files will be backed up as they are changed.

What is universally true with all these apps is that the first backup

will test your patience. One of the unfortunate truths of Australian internet is that upload speeds are poor across the board (with the possible exception of the top tiers of NBN fibre). That means your first backup will literally take days or weeks to complete. Even if you maxed out the uploads on an ADSL 2+ service around the clock, you're unlikely to be able to upload more than 6-8GB per day. It will also likely gut your monthly quota, since now nearly every ISP also meters uploads.

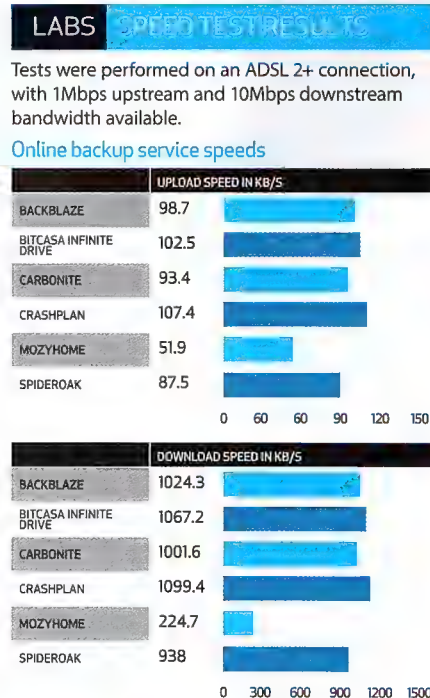
The point is: plan ahead for your first backup, and never do it over a connection where you might face excess usage charges. Subsequent backups will be much quicker, since only changed files will be updated, but you still have to be careful about your usage. If you're on a low volume plan, online backup may not be the best option for you.

"One of the unfortunate truths of Australian internet is that upload speeds are poor across the board (with the possible exception of the top tiers of NBN fibre). That means your first backup will literally take days or weeks to complete."

TEST RESULTS

During our review process we decided to test the performance of all of the backup solutions. We put together a collection of ten 20MB files and uploaded them to the services, then used recovery to download those files again. We timed the transfers with a stopwatch.

We did all our tests using a standard ADSL 2+ connection supplied by iiNet. The connected line



speed was 10Mbps down and 1Mbps up, although as you might expect actual throughput is a little lower than that given protocol overhead.

The results are shown in the speed test graphs above. As you can see, with the very notable exception of MozyHome, all of the backup services we tested essentially maxed out our internet connection, which is a very good sign for even full system backups.

BACKBLAZE

Home How It Works Buy Now For Business About Us

View/Restore Files

Overview
Account
View/Restore Files
My Restores
Locate My Computer
Transactions

Choose Method

Download Zip File (Free)

You will receive an email once your files are ready.
Your files will be put into a zip format and available for download.
USB Flash Drive (\$99) 110,000 MB max (128 GB)
Your files will be sent on a USB Flash Drive.
(You will receive a drive large enough to contain your data.)
USB Hard Drive (\$189) 3,000,000 MB max (3 TB)
Your files will be sent on an external USB Hard Drive.
(You will receive a drive large enough to contain your data.)

Choose files below to restore

Continue with Restore

Selected 0 bytes

Machine	desktop_2014_03_09	Files backed up from	Beginning of Time	to	Today at 12:10 PM
Folders	Select all folders and files	Files	Name	Size	Modified

US\$5/MONTH PER PC FOR UNLIMITED STORAGE
WWW.BACKBLAZE.COM

BACKBLAZE

Custom made for full-system backups.

Backblaze is an unusual service in more ways than one. First of all, it's only built for full system backups. Secondly, recovery doesn't use the default software: instead you download the files as a .zip (or, for a fee, Backblaze will send it to you on a flash or hard drive).

As a full system backup tool, it's simple and works very well. You don't really have to configure anything; you can just let it do its thing. It backs up everything except a specific list of folders and certain file types. You can manually edit the list of exclusions — by default system files and folders are excluded. In fact, doing anything other than a complete system backup is actually quite difficult.

Backup can be set to continuous, which is very useful for ensuring that the latest versions of files are always backed up, although we'd be concerned about the bandwidth requirements, especially if you're editing large files. You can set a limit (in GB/day) on backups,

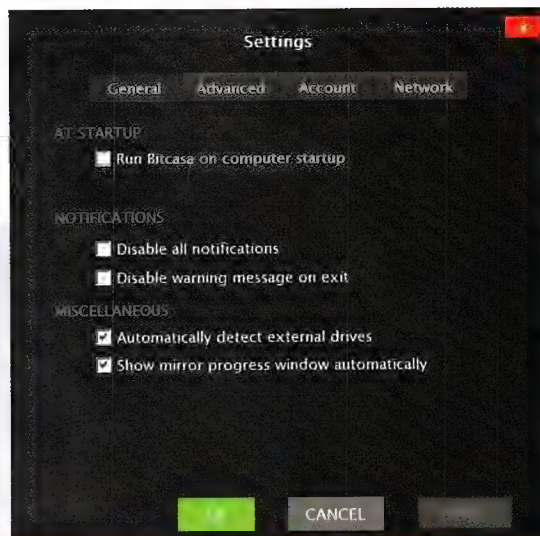
however, and manual and daily schedules can also be configured.

Restoration is done via the Backblaze web site. You log in, select the files you'd like to recover, and Backblaze will create a .zip file containing. It's actually pretty elegant, since you don't have install software to access your files, and you can download files onto any system. Although it took a few minutes to build the .zip file, the download itself was extremely fast.

As a full system backup solution, we really like Backblaze. It has quirks, like the lack of specific file selection and the zip-based restoration method, but if all you want is an easy way to back up your full system, you could do a lot worse.

Verdict

An easy way to perform full system online backups with fast, unlimited storage.



20GB AND 3 DEVICES FOR FREE; 1TB AND 5 DEVICES FOR US\$10/MONTH; 5TB AND 5 DEVICES FOR US\$49/MONTH; UNLIMITED STORAGE AND 5 DEVICES FOR US\$99/MONTH | WWW.BITCASA.COM

BITCASA INFINITE DRIVE

A hybrid backup and Dropbox-style syncing tool.

If you're looking for versatility, Bitcasa Infinite Drive may be just the type of tool you need. Bitcasa is something of a new breed of hybrid solution, combining Dropbox-esque folder syncing across devices with Carbonite-style system backups.

As a syncing tool, Bitcasa works a lot like Dropbox. It creates a separate virtual drive (with its own drive letter) in Windows Explorer. You can copy files onto that drive, and the file will then be available on all the devices on which you have the Bitcasa app installed.

There are apps for PC as well as Windows Phone, iOS, Android, and you can also access the contents of your sync drive via a web browser. Of course, Bitcasa doesn't have the installed base of Dropbox, and while you can send links to individual file downloads, it doesn't have anywhere near the sophisticated folder sharing capabilities of Dropbox.

It also has backup tools

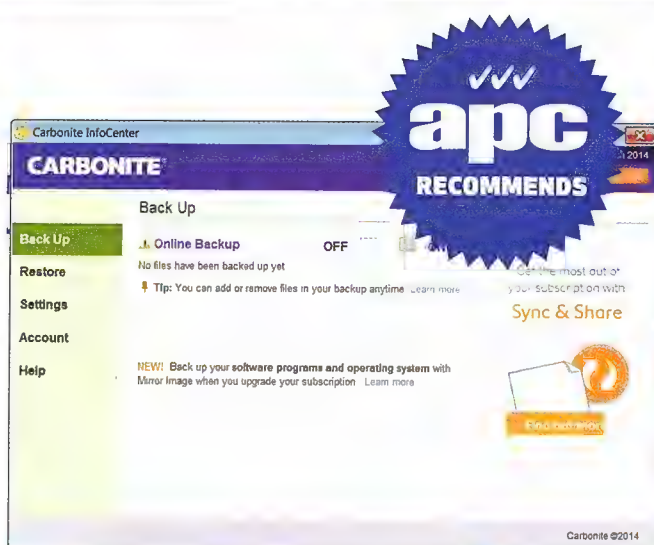
built in. Right clicking on a folder in Windows Explorer, you can choose to mirror the folder in Bitcasa. This creates a continuous backup of that folder on the Infinite Drive. As soon as a file is added or modified in that folder, it will be reflected and updated on the Bitcasa mirror. It's a relatively simple tool, but we found it really useful as a backup system, and a nice departure from the tree selection diagrams of other backup tools.

There isn't a lot to it but it's a simple way to mirror your directories onto an online drive for later recovery.

Verdict

Very simple interface that's as fast as your internet connection. But it's inferior to Dropbox.





US\$60 PER YEAR FOR UNLIMITED STORAGE FOR 1 PC
| WWW.CARBONITE.COM

CARBONITE PERSONAL BASIC

An easy to use full-system backup.

During our tests, Carbonite effectively maxed out our internet connection during backup and restore operations. While the loss of local support and a fixed price in Australian dollars is a bummer, Carbonite remains an excellent backup service overall.

Like Backblaze, Carbonite is built specifically for full system backups (with exclusions for system and executable files). Trying to use it for individual folder syncing, file sharing or anything else is likely to leave you very frustrated. However, as a total system backup tool it has few rivals. The software is beautifully designed, is very fast and has a logical and consistent interface for managing your backups and recovering lost files, including files you've accidentally deleted in the last 30 days. It also retains multiple versions of files for 30 days.

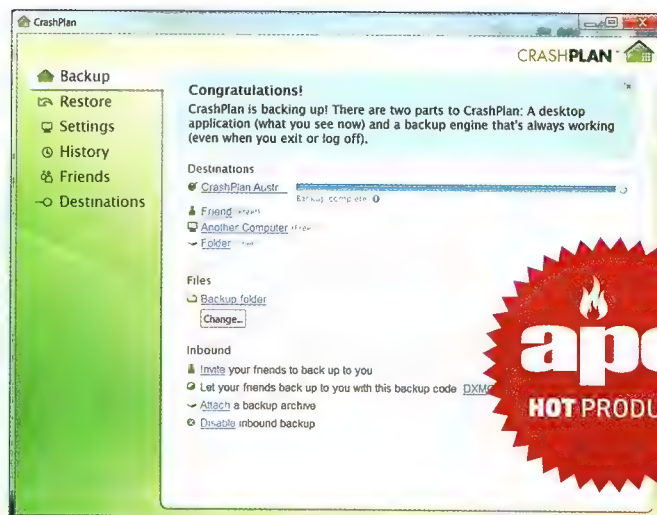
Backups can be set to continuous or scheduled, and you can manage the exclusion list as well as add

individual files to the backup schedule. You can also access backed up files from a mobile or tablet using a Carbonite app available from Google Play or the iTunes App Store – in this way it can be used to transfer files to your mobile, but it's an ugly and complicated ritual compared to a simpler solution like Dropbox.

The Basic package is costed at a very reasonable US\$60 per year for unlimited storage, and Carbonite also offers Personal Plus for US\$100, which adds external drive backup and complete system mirroring, and Personal Prime for US\$150, which includes a courier service to ship backups to you if you need faster recovery than your internet service allows.

Verdict

No real configuration requirements with unlimited storage and mobile access to files.



FREE FOR BACKUP TO FRIENDS/DIRECTORY/OTHER PCS; \$69.30 PER YEAR FOR UNLIMITED BACKUP FOR 1 PC; \$165 FOR PER YEAR FOR UNLIMITED BACKUP FOR 2-10 PCS | WWW.CODE42.COM

CRASHPLAN

An easy to use and incredibly flexible solution where you set the backup destination of your choice.

Even though it lacks some of the one-click simplicity of many of its rivals, CrashPlan remains one of our favourite backup tools. That's because it offers something that no other solution does: the capacity to back your data up onto a friend's computer and vice versa. Rather than using a service-provider cloud, you create your own personal cloud. It gives you an off-site backup solution, but without a monthly fee or the need to entrust your files to a faceless third party.

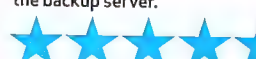
It's all managed through the destinations panel. Using a unique code, you can add other PCs you own or the PCs of friends who are running CrashPlan to the backup destination list. You can also give them a code, and they can use it to back up their files to your PC. Archives are encrypted, so you can't see each other's files. After that, you set the files you'd like to back up using a standard directory tree checkbox and configure backup times, which can be continuous, scheduled or when idle.

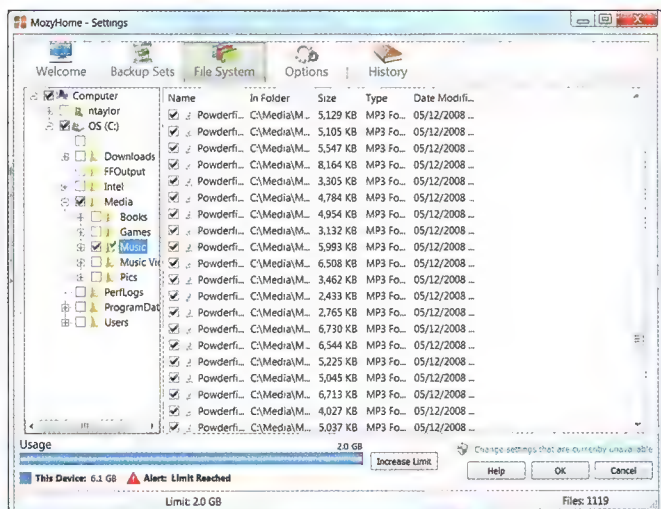
Of course, if you don't want to bother your friends (or you don't have any), you can set CrashPlan's Australian Datacentre as your backup destination. This requires a subscription (it costs nothing to backup to a friend's computer), but CrashPlan offers unlimited storage at a reasonable price. This is the service we tested, and it delivered when it came to speeds, effectively maxing out our broadband connection on both backup and restore.

The incredible flexibility of CrashPlan, as well as the reasonable prices, high speed and local datacentre make CrashPlan a top pick for us. It's easy to use and lets you do online backup the way you want – with or without a subscription.

Verdict

Flexible, low cost backup options; you can use a friend's computer as the backup server.





PRICE US\$5.99/MONTH FOR 1 PC/50GB; US\$9.99/MONTH FOR 3 PCS/125GB | MOZY.COM

MOZYHOME

Excellent software, but highly priced and poorly performing.

One of the most established players in online backup, Mozy has one of the most refined systems we've seen. The software in particular is outstanding, offering just the right amount of configurability without overwhelming the user.

During setup, it performs a quick scan of your PC, creating what it calls "backup sets". These are collections of files of a given type: email archives, photos, music, videos etc. It's a common feature in many of the better desktop backup tools, and it's really well implemented here. If you prefer more granular control, you can choose specific folders to backup. It's all quite intuitive.

You can set it to back up on a schedule, or use an automatic system where MozyHome will back up files automatically when the computer has been idle for a set period and if the CPU usage is below a certain threshold. It's a really elegant system, and Mozy deserves many props for

making the software this easy to use.

What it doesn't deserve praise for is its speed. Not only does the backup process take a while to initiate, it was painfully slow during our tests, using less than half of the available upstream bandwidth. After the first backup, it's probably not that big of an issue, but expect the initial backup to literally take weeks. The recovery process was barely better, returning backed up files at a little more than 200KB/s on a connection that should be able to deliver more than 1MB/s.

While we love the software that Mozy provides, the price and performance of the service are a little underwhelming.

Verdict

Excellent backup software that schedules backups when PC is idle. It's pricey and slow though.



PRICE \$10/MONTH PER 100GB. UNLIMITED DEVICES | SPIDEROAK.COM

SPIDEROAK

A compelling hybrid backup and syncing solution.

Like Bitcasa, SpiderOak is a hybrid solution, capable of both folder syncing across multiple devices (including mobiles, Macs and Linux PCs) and file-based system backup. It's charged entirely by volume, with each 100GB of storage costing US\$10 per month, and as many PCs as you like can back up into that storage space.

SpiderOak is first and foremost a backup solution. It supports continuous automatic backup as well as scheduled backups.

The Mac-ish origins are evident in its design, and it takes a few shortcuts on Windows. For example, the default backup selection are based on categories: Music, Documents etc. But it's not based on a scan of your hard drive — it's a pointer to the directories in your User folder; any files not in those folders won't be backed up. Fortunately, you can manually add folders to the backup schedule.

Recovering files is easy. Head to the view panel and you'll get a branching tree

view of all the files backed up, starting with the device you backed them up from. From the application you can generate web links to files stored in SpiderOak, making sharing them with other people very easy.

The syncing part is called SpiderOak Hive and it's the newest addition to the platform. It works as a Dropbox-like directory on, where anything you drag and drop into the folder is automatically synced between your devices and on the server. You can create multiple syncing folders and choose which ones you want to see on a given device, which is very cool, and you can also create shares that other authorised SpiderOak users can access.

Verdict

Includes a very solid folder syncing system with sharing support and excellent recovery options.



Round UPS

Everyone loves power, but not as much as your tech gear. Darren Yates rounds up the latest UPSs that'll keep your gear humming.

As a desktop PC enthusiast, there are times you'll look upon your notebook-toting cousins-in-tech with their battery backup and curse – usually just when the mains power goes off and you've lost your university assignment or, worse, all of that awesome work on *Metro: Last Light*. But that's where an uninterruptible power supply (UPS) can help – not necessarily to keep you fragging through the night, but at least to gracefully shut down your PC so nothing goes missing. But how do you pick the right model and what do the specs mean?

UPS 101

A UPS is essentially a battery backup, or more precisely a short-term AC inverter. When the AC mains is fine, it provides nothing more than surge protection and in some models, added voltage regulation. But, the instant the mains fails – and we're usually talking within ten milliseconds – it switches over to backup power in the form of one or more sealed-lead-acid (SLA) batteries (these are similar to your car battery but with a gel electrolyte, not liquid sulphuric acid).

The AC inverter turns the 12 or 24VDC battery voltage into 230VAC mains voltage to feed your tech.

INVERTERS AND BATTERIES

UPSs often have lots of extras but you can boil down the specs into two major criteria – the capacity of the inverter to power a load and the capacity of the batteries to keep it running.

"UPSs often have lots of extras but you can boil down the specs into two major criteria – the capacity of the inverter to power a load and the capacity of the batteries to keep it running."

An inverter is like a car engine – it delivers a certain maximum power output. Just as you can't expect a three-cylinder engine to power a 'B-Double' truck, a UPS has to be at least rated to the electrical load you want it to drive.

Power capacity is measured either in volts-amps (VA) or watts (W) – VA is the

UNINTERRUPTIBLE POWER SUPPLIES – HOW THEY COMPARE

MODEL	APC BACK UPS 1100	APC BACK UPS PRO 550	BELKIN 600VA	CYBERPOWER BR650ELCD	CYBERPOWER VALUE 1200ELCD	DIGITECH MP5205	DIGITECH MP5207
STREET PRICE	\$210	\$220	\$120	\$149	\$225	\$129	\$299
CAPACITY - VOLTS-AMPS (VA)	1100	550	600	650	1200	650	1500
CAPACITY - WATTS (W)	660	330	360	390	720	390	900
AC OUTPUTS (NUMBER X TYPE)	6 X IEC	6 X IEC	4 X IEC	6 X GPO	4 X GPO	2 X GPO	2 X GPO
AC OUTPUTS ON BATTERY BACKUP	6	3	3	3	4	2	2
AC OUTPUT VOLTAGE (VAC)	230	230	230	230+/-10%	230+/-5%	230+/-10%	230+/-10%
OUTPUT WAVEFORM	MODIFIED SINE	MODIFIED SINE	MODIFIED SINE	SIMULATED SINE	SIMULATED SINE	MODIFIED SINE	MODIFIED SINE
FEATURES							
AVR	YES	YES	N/A	YES	YES	N/A	N/A
USB CONNECTIVITY	NO	YES	YES	YES	YES	YES	YES
SOFTWARE SUPPLIED	NO	YES	YES	YES	YES	YES	YES
LCD SCREEN	NO	YES	NO	YES	YES	YES	YES
VOLTAGE DISPLAY	NO	YES	NO	YES	YES	YES	YES
INSURANCE	NONE	NONE	\$100,000	\$75,000	\$75,000	NONE	NONE
BATTERIES							
BATTERY TYPE	SLA	SLA	SLA	SLA	SLA	SLA	SLA
BATTERY VOLTAGE/CAPACITY (V/AH)	12/7 (X2)	12/7	N/A	12/7	12/7 (X2)	12/7	12/9 (X2)
BATTERY RUNTIME (MINS:SECS)	46:05	17:38	17:03	15:25	23:05	10:19	66:51
TYPICAL RECHARGE TIME (HRS)	8	12	6	8	8	8	8
WEIGHT (KGS)	12	6.5	5.2	5.5	11.2	TBC	TBC



\$220 | WWW.APC.COM

What the specs mean

AVR: Automatic Voltage Regulation is designed to improve the quality of the AC mains voltage, raising it to the right level during brownouts and dropping it during surges. All UPSs have AVR when running on battery.

Modified/simulated sinewave output: Australia's AC mains voltage 'alternates' in the form of a 50Hz sinewave. Making an AC inverter do this is expensive so cheaper models use a 'modified' or 'simulated' sinewave that's a series of rising and falling voltage steps. It's not the real thing but for many devices, it's close enough. Waveform-sensitive devices may struggle with it, though. All of the units we tested were mod-sine designs.

AC or 'apparent' power rating; watts is the DC or 'actual power used' rating. See the 'What is Power Factor' box for more details, but bottom-line, look for the watts rating on consumer-grade UPSs. Not all UPSs publish this up-front since it's the smaller number — in that case, take 60% of the VA figure as a fair approximate of the watts rating, the real load the UPS can handle.

As for batteries, the rule seems simple enough: the bigger the battery or the more batteries it has, the longer the inverter keeps running. But like most things, it's not always that simple.

Let's break it out quickly:

- SLA batteries are heavy — add in two batteries and a UPS hits ten kilos real quick.
- The battery has to have sufficient capacity to handle the demands of the inverter.
- Bigger battery capacities last proportionally longer than smaller ones.

HOW TO CHOOSE

A UPS watt rating must at least match the power draw of the gear you want powered. How long a UPS runs for depends on whether you just want a graceful shutdown or to keep going.

That ultimately sets the size, capacity and price of the UPS you need to choose.

What is Power Factor?

Power Factor (PF) is the ratio between this real 'watts' power used to the apparent VA power required. An incandescent lamp is purely resistive, so has a PF of 1.0 — it uses all the power it requires. An induction motor may have a PF of 0.5 where half the power (the 'apparent' power) disappears back into the electricity grid, but still has to be supplied for the motor to run. That's why inductive loads are always more difficult for UPSs/inverters to power — they need access to more power than they actually use.

APC BACK UPS PRO 550

Good performance and well-featured, but it's not cheap.

The Back UPS Pro 550 wasn't just the smallest UPS we saw this roundup, it was also the most expensive of the sub-1000VA models and not far behind a couple of the 1200VA category as well. APC is arguably the 'Rolls Royce' brand when it comes to consumer-grade UPSs, so it doesn't surprise us you pay a bit extra. However, that said, it outlasted its category rivals, topping 17mins38secs — that's a decent effort from one 12V/7Ah SLA battery.

APC's PowerChute USB software is clean and user-friendly, giving you all the information you need. But like all good software, it can be set any number of ways from automatic shut-down on power fail to automatic self-testing. As soon as it switches to battery, it starts emitting four beeps every 30 seconds as a warning.

While there are six IEC320 sockets here, only three are battery backed — the rest are surge-

protection only, so it's really a single-user model. It also has a unique feature where one of the battery backed IEC sockets can act as a master socket controlling two of the surge-only ports. If the master socket goes off, so do the other two.

If there is a downside, other than price, it's the 12-hour battery recharge spec, which is four hours longer than any other model we saw. That said, slower charging is said to be better for long-term reliability, so it maybe a case of 'swings and roundabouts'.

Verdict

Delivered the best runtime from a single 7Ah battery, but much more expensive than similar models.





\$210 | WWW.APC.COM

APC BACK UPS 1100

Has few features, but it cranks out power for a bargain price.

By contrast to APC's Back UPS Pro 550, there are no airs or graces with this Back UPS 1100 – it's just a real workhorse of a UPS. It has no USB connection, no software, no LCD screen. It's also another to use IEC connectors rather than Australia's standard GPO (general purpose outlet, also known as standard 'AS3112'), but the 1100 is an old-style basic featured UPS that gives you plenty of runtime for your buck. More precisely, we managed just over 46mins before it gave out running our 110-watt PC/monitor test rig. The two 12V SLA batteries are smaller 7Ah capacity units compared with Jaycar/Digitech's 9Ah so we think the runtime is on the money. Still, at 12kgs, moving it isn't something to be done very often.

Having IEC320 sockets rather than AS3112 GPOs makes it less appealing, but that no doubt also helps lower costs, since APC can ship this unit around the world and just modify the

AC output voltage to suit. What's more, there are six IEC sockets, all battery backed, so you've got at least three PC/monitor combinations covered, right there.

In the end though, the key feature is the price – at \$210 on the street, it's a tight contest for the most output power and battery runtime per dollar between this and Jaycar's Digitech MP5207. For extra user features, frankly, the Back UPS 1100 has nothing. But we can see it being like a well-worn ute – not much to look at, but it'll likely be still running when fancier boxes have carked it.

Verdict

This one reminds us of a Holden ute – no fancy bits, just plenty of power at a hard-to-beat price.



\$120 | WWW.BELKIN.COM.AU

BELKIN 600VA

A decent, no-nonsense budget UPS.

This Belkin 600VA UPS is an example of the popularity of promoting the larger VA rating. In the instruction manual, it's listed as 600VA/360-watts. It provides four IEC sockets (three with battery backup and all with surge protection) and although there's no LCD screen, it comes with USB connection and PC software (but why we need 284MB of it is anyone's guess). The software isn't exactly the richest in providing info, either – there's no load percentage, no battery voltage or capacity remaining.

But that said, the Belkin 600VA really did surprised us, lasting just on 17mins with our 120-watt PC/monitor load. With the standard 12V/7Ah SLA battery used, that's still a pretty decent result, particularly given how much APC wants for its Back UPS Pro 550. It has a very quick switchover on power failure (no greater than six milliseconds), however, the

inverter circuitry has a bit of a buzz to it when it kicks in. The UPS also adds RJ11 phone connection protection and backs it up with a \$100,000 worth of connected product insurance, more than anyone else (although, not reason alone to buy it).

No-one loves audible alarms but the Belkin unit has four alarm modes, including beeping every ten seconds when on battery power. Its six-hour charge time is also the fastest we saw.

All up, it's quite reasonable value for a UPS you'll find on the street for around \$120.

Verdict

No LCD screen, but gives decent runtime for what was the cheapest UPS we saw.





\$149 (\$120 ONLINE) | WWW.CPSWWW.COM.AU

CYBERPOWER BRIC BR650ELCD

Full of features, decent performance at a nice price.

CyberPower's BRIC series is appropriately named, given it's a brick-styling (as opposed to the increasingly common mini-tower designs), but for its price, its good value. Coming in just under the \$150 mark, its 15mins25sec runtime easily outlasted the Digitech MP5205 despite featuring the same capacity battery and came close to the Belkin 600VA model. However, the BR650ELCD also has a decent LCD panel and USB connectivity. The fact it has six GPOs ready to go rather than just the more globally-universal IEC320 sockets will likely make it more expensive to build, but certainly much more versatile. The downside is only three of those GPOs have battery backup – the other three are surge arresting only. It also delivers RJ11/RJ45 in/out ports for phone or data protection, plus there's a USB power port too. Of course, you can just plug in your AC USB adapter, but the direct port is slightly more

efficient. One other important bonus was its quiet operation – pretty close to whisper-quiet compared to some of the 'bar fridges' we heard.

CyberPower uses the PowerPanel app for this and its bigger Value1200ELCD model. The app is nicely put together, easy to read and like all good apps, gives you a decent array of controls. Given the other models around this 550-650VA rating, the BR650ELCD delivered the right mix of features, performance and price. Speaking of which, you'll find this one at major retailers for around \$149, but we've seen it online from the likes of Mwave (www.mwave.com.au) for under \$120. At that price, it's a no-brainer.

Verdict

Aussie GPOs, decent 15+mins runtime, good software and a \$120 street price make this hard to beat.



\$225 | WWW.CPSWWW.COM.AU

CYBERPOWER VALUE 1200ELCD

High-power capacity, but short on runtime.

The Value1200ELCD from CyberPower has plenty of horsepower under the bonnet, able to handle up to 1200VA/720W and with four standard GPO outputs, you won't be fighting for a spot on this one. It features the same software and LCD panel as the smaller BR650ELCD, but doubles the battery capacity with two 12V/7Ah SLA batteries. Being a high-powered unit, there is a bit of a buzz from the inverter while it's running, but the cooling fan in the back was more noticeable when it fired up.

What surprised us a bit more was the battery runtime. Even with our fairly modest load, it only managed 23mins05secs – that's quite a way back compared with the Digitech MP5207 and APC Back UPS 1100. Still, CyberPower says it'll only manage 10mins anyway at half load (360W), so our result is within reason. It's worth noting that this is only \$5 more expensive than APC's Back UPS Pro

550 but with double the output capacity and overall, there's plenty to like here, with its \$75,000 connected insurance, standard GPOs, AVR and internal current limiting (preventing UPS overload).

Ultimately, having the ability to handle heavier loads means these high-powered UPSs are less efficient at smaller load levels, compared with smaller UPSs. That said, with the Back UPS 1100 hitting 46mins and the Digitech MP5207 lasting more than an hour, our Value1200ELCD test unit was a bit off the pace.

Verdict

For such a sizeable unit, the runtime from those two 7Ah batteries was a bit disappointing.





\$129 | WWW.JAYCAR.COM.AU

DIGITECH MP5205

Compact with good features but low on runtime.

There's a real price difference between the Digitech MP5205 and MP5207 UPSs from Jaycar Electronics and in the end, these two were bookends on our test results. The MP5205 features the standard single 12V/7Ah SLA battery and a quite decent orange LCD panel with plenty of information (especially given the price). In fact, it's the same panel that appears on the higher-capacity MP5207. It has USB connectivity and comes with software that does the usual tricks such as auto-shutdown on power fail (although why it bothers with a serial number is beyond us). However, the software is a bit rough around the edges and not particularly user friendly (serif fonts on software never look great).

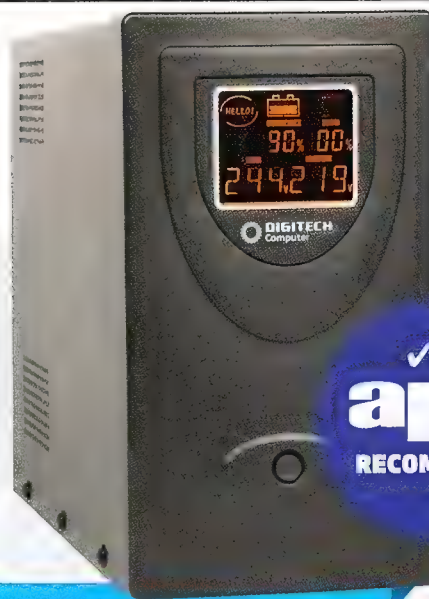
It comes with just two outputs but they are standard Aussie GPOs, which helps, but arguably the greatest drawback here is the runtime. At just over ten minutes, you've got

enough time for a graceful PC shutdown, but not a whole lot left over and given the eight-hour recharge time, it won't handle too many close-occurring blackouts. Jaycar doesn't mention if this unit has AVR on its AC leg.

Obviously, instigating a power failure for a labs test isn't a safe thing, so we simulated it by turning off the power to each of the UPSs. However, a couple of times, our MP5205 test unit failed to trip and fire up the AC inverter, knocking out our test PC. It's not the most scientific of tests, but we didn't see this happen on any other unit we tested.

Verdict

Has all the features, but software lacks a little polish.



\$299 | WWW.JAYCAR.COM.AU

DIGITECH MP5207

Lacks for smooth corners, makes up in performance.

Digitech is Jaycar Electronics' house brand, and it takes the award for the longest-lasting UPS we tested. Packed with two 12V/9Ah SLA batteries, we had to wait 1hr06mins for this one to fall over — that's an exceptional result. Further, it's rated at a heavy 1500VA (or 900W), which meant our 120-watt PC load really didn't overly tax those batteries, resulting in that one-hour-plus time. Its USB connected and comes with the same rough-but-passable software as the MP5205 with good data on power features inside the unit. The LCD panel is also the same and delivers lots of information — that said, we're a bit 'iffy' about some of the data we saw from it. For example, the battery percentage sat on 90% for around 40mins, then started dropping down steadily. What disappointed us a little was having only two GPOs to play with — sure, a six-way powerboard makes short work of that issue, but given the \$299 price tag

and the size of the unit, extra outlets would've been a nice touch. The anchored AC cable didn't overly impress either. And it has to be said, our test unit buzzed quite noticeably, enough for someone in the office to call it a bar fridge!

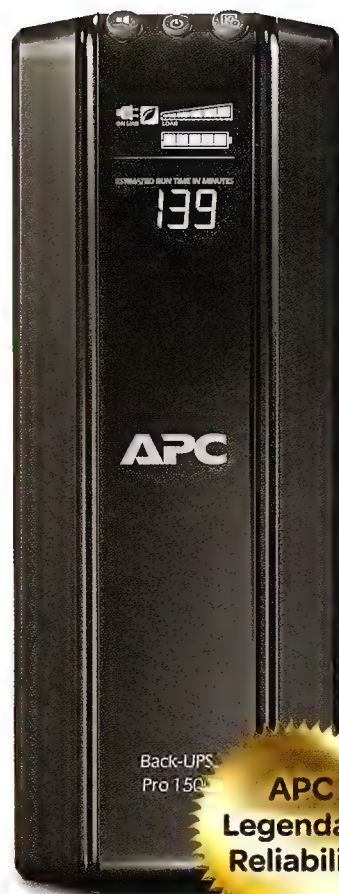
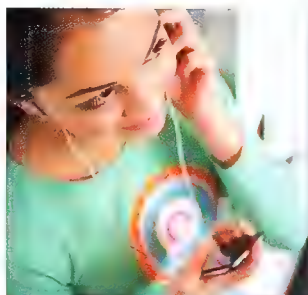
But overall, despite being the most expensive model we tested, it was also clearly the longest lasting and highest-capacity unit we saw. You wouldn't get an hour of solid gaming from it but for light-duty work, you'd get close. But here's the real benefit — this unit would survive quite a few blackouts before its batteries required serious recharging.

Verdict

Most expensive unit we tested but outlasted everything else for runtime by a decent margin.



With APC Back-UPS, your digital life goes on... even when the power goes off.



Preserve what's most important to you.

Reliable power backup for 24/7 availability

Whether DVRing your favorite show, updating your Facebook status, or playing a live networked game, you depend on your home electronics every day, all day. That's why APC by Schneider Electric has designed battery backup solutions that protect the constant availability and connectivity you expect... and depend on.

Peace-of-mind protection on two levels

When the power goes out, our popular Back-UPS units go to work. They instantly switch your home technologies to emergency power, allowing you to work through brief power outages or safely shut down your systems so you won't lose valuable files—such as digital photos and media libraries. They also feature surge outlets to guard your electronics and data from "dirty" power and damaging power surges—even lightning. So you get two levels of protection in every APC Back-UPS unit!

Energy-saving insurance for what matters most

Our Back-UPS units protect your home office, digital living and home media applications, notebook computers, DVRs, and gaming application. And since we now offer energy-efficient models that reduce electricity costs through unique power-saving outlets, you can realise true energy savings regardless of the applications you're backing up. Throughout your home, the APC Back-UPS is the cost-saving insurance you need to stay up and running and reliably safeguarded from both unpredictable power and wasteful energy drains.



Keep your electronics up and
your energy use down!

ES Series

The ever-popular ES models are priced affordably yet provide enough extended runtime to allow you to work through short and medium power outages. Some power-saving models have been designed to actively reduce energy costs.

The energy-efficient ES 700G

The ES 700G boasts innovative power-saving outlets, which automatically shut off power to unused devices when your electronics are turned off or asleep, eliminating wasteful electricity drains.

- 8 Outlets • 405 Watts / 700 VA
- 68 Minutes Maximum Runtime**
- Telephone/Network Protection



The best-value ES 550G

The ES 550 uses an ultra-efficient design that consumes less power during normal operation than any other battery backup in its class, saving you money on your electricity bill.

- 8 Outlets • 330 Watts / 550 VA
- 51 minutes Maximum Runtime**
- Telephone/Network Protection



APC
by Schneider Electric

Power up to **WIN 1 of 3 APC ES700G Battery Back-UPS units!***
Visit www.apc.com/promo Key Code **53682K**

Back up your critical files in Windows 7

Would you want to lose everything if your computer went kaput? Of course not, so it pays to create a backup of your PC — here's how to do it.



When you buy a new PC or build your own, you should make it a priority to back everything up. If you don't and something goes wrong, you could lose irreplaceable data.

Creating a backup doesn't require any specialist knowledge, and takes the same amount of time as it does to watch an episode of *Game of Thrones*. The initial backup may take a little

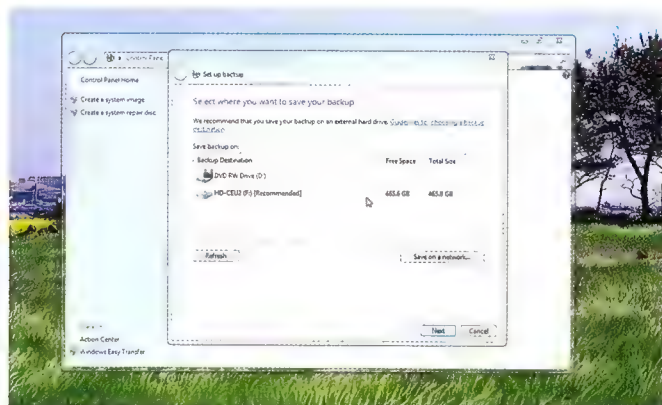
while to complete, but subsequent backups won't take anywhere near as long, as you're only making copies of files you've recently changed or added.

To make a backup, you need something to save your files on. An external hard drive is the easiest option: they're cheap, have a very large storage capacity, and you can plug them in with a USB cable and use them immediately.

Keep your digital life safe — make a backup now!

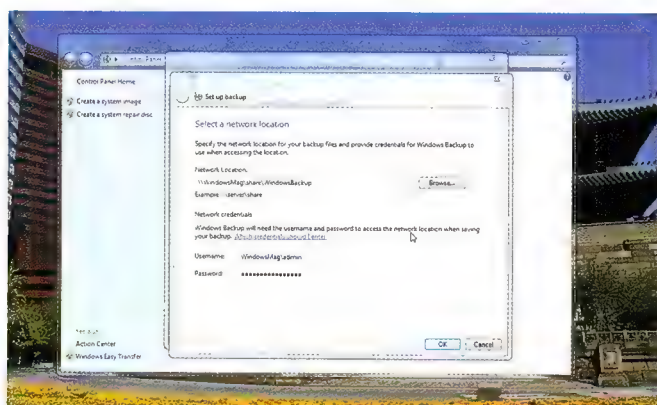
Create a backup right now

Can you really afford to put off something so simple (and important)?



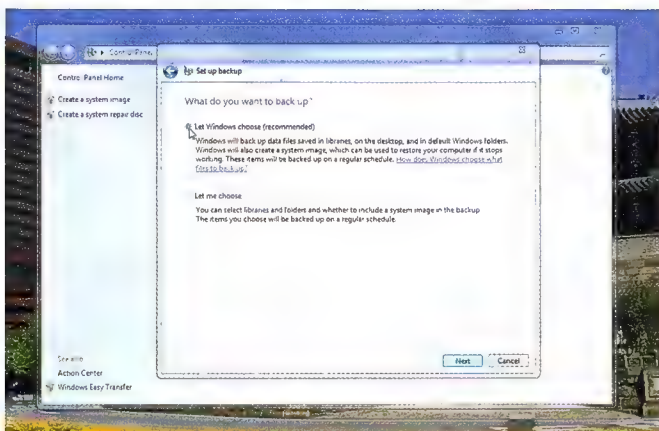
1 CHOOSE A DRIVE

To start backing up files from your PC, plug in your external hard drive and click 'Start > Control Panel > System and security > Backup and restore'. Now click on 'Set up backup' and select your external hard drive from the list of possible destinations. Before you proceed, make sure that the external hard drive is bigger than the internal drive you're backing up.



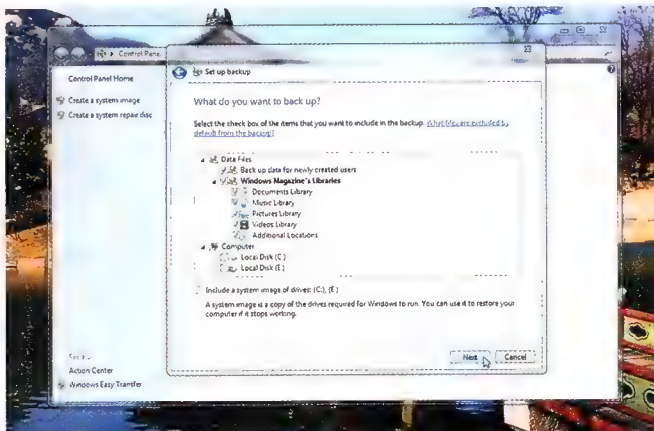
2 DIFFERENT LOCATION

If you have more than one PC, you might prefer to back up to a network drive. The benefit of this is that all the PCs on your network can access it, so you don't need an external hard drive for each one. To save files to a network drive, click on 'Save on a network'. Enter the location of the network (browse for it on your PC), then enter the username and password.



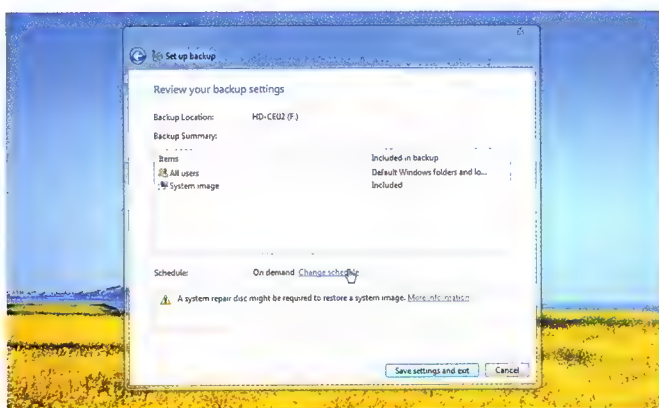
3 BACK UP EVERYTHING

Select what you want to back up. The easy option is 'Let Windows choose'. This backs up most of your files and folders, except ones that aren't needed, or can't be backed up. It also creates a system image, like a mirror of your PC, so if there's a problem with your PC, you can easily restore it.



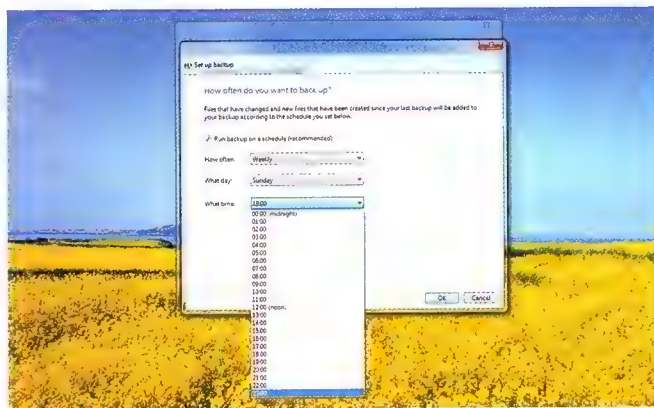
4 PICK AND CHOOSE

If you only want to select a few folders to back up, rather than most of what's on your PC, select the 'Let me choose' option from the list. This also gives you the opportunity to change when you perform a backup. Click on Next and select the folders that you would like to include in your backup.



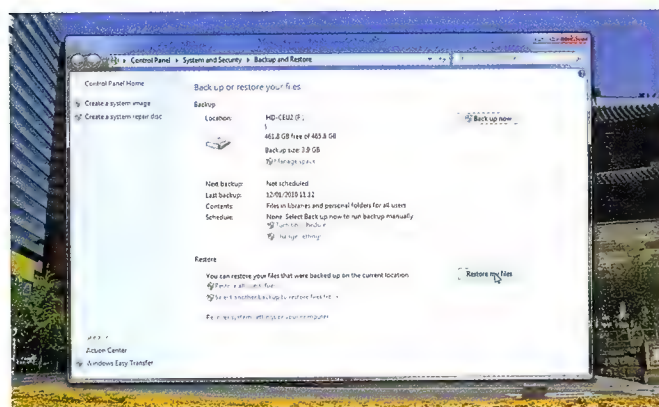
5 MAKE AN IMAGE

Keep the 'Include a system image of drives' tick box checked if you want to be able to easily restore your PC if something goes wrong, then click Next and confirm that you're backing up the right folders. If you want to change how often you back up your PC, click on 'Change schedule'.



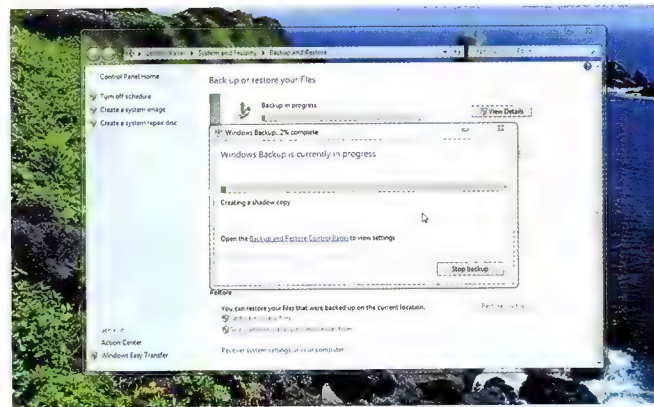
6 CHANGE SCHEDULE

By default, backups are made once a week, but you can change the frequency. The best time to make a backup is when you're not using your computer, such as overnight. This is especially true if you have a lot of files to back up. Use the drop-down menus to change the schedule. Click on OK and your computer begins making a backup.



7 RESURRECT YOUR PC

If something goes wrong and you want to restore your PC using your backup, go to the Backup and Restore Center and click on 'Restore my files'. If there's a serious problem and you can't even access Windows, press F8 on your keyboard before the Windows logo shows during startup, insert your Windows CD and choose 'Repair your computer'.



8 BREATHE A SIGH OF RELIEF

You should now be feeling much more confident, because your PC is a lot safer. You've created a backup of your PC on an external hard drive or network drive, and you can restore it to its old settings if anything gets wiped accidentally. You can even get everything back if you have a more serious problem that prevents you loading Windows.

Back up with Time Machine

Apple's Time Machine is one of the easiest backup options around.

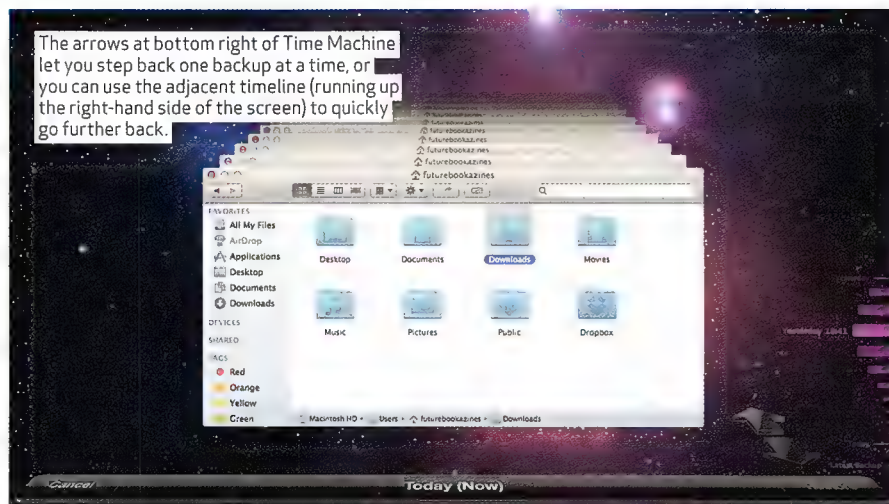
Time Machine is the Mac's built-in backup system. All you need to provide to make it work is an external hard drive. Once set up, Time Machine makes hourly backups of any changed files on your Mac to the second drive.

This gives you a way to recover damaged and accidentally deleted files. Time Machine also allows you to roll back your whole OS to an earlier version if an update causes problems. It can also be leveraged by the Migration Assistant to move user accounts, files and settings to a new Mac.

If you own several Macs or even just one MacBook, Apple makes a combined wireless router and hard drive called AirPort Time Capsule which can make it easier to back up, as you don't have to connect any cables. When your Mac connects to the same network as the Time Capsule, it will back up to it.

If you just want to use an external drive, it needs to be Mac-formatted. Connect the drive to your Mac and OS X will ask whether you want to set it up to use it with Time Machine. Using a drive to store Time Machine backups doesn't mean you can't also use it for other purposes. It will still appear as a regular hard drive in the Finder. However, it's a good idea not to use it as a general place to store files. That's not only to maximise the space available for Time Machine, but also because Time Machine won't back up the drive you assign it to use.

Within just a few clicks, you can be backing up your files. Then, every time you connect that drive, Time Machine will, after a few seconds, start backing up anything that's changed or new. Once you've completed the quick and simple setup process, Time Machine is designed to need as little intervention



from you as possible, and to be almost invisible until the point when you need to restore a file, at which point it will step in and save the day!

Time Machine doesn't simply copy or 'clone' everything that's on your hard drive. Instead, once you've created the initial backup, it creates incremental backups and, using a clever piece of interface design, allows you to step back in time to find a deleted file.

Time Machine is not an archive program, though: remember, it saves backups hourly, which introduces a potential pitfall. If you were to create a file and delete it within one of these hour-long intervals, no back up of that file will be created at all.

Also, saving an hourly snapshot of everything on your Mac would fill the backup drive very quickly, and it would take a while. Instead, Time Machine saves hourly backups for the past day, consolidated daily backups for the last month, and weekly backups beyond that, until your drive runs out of space.

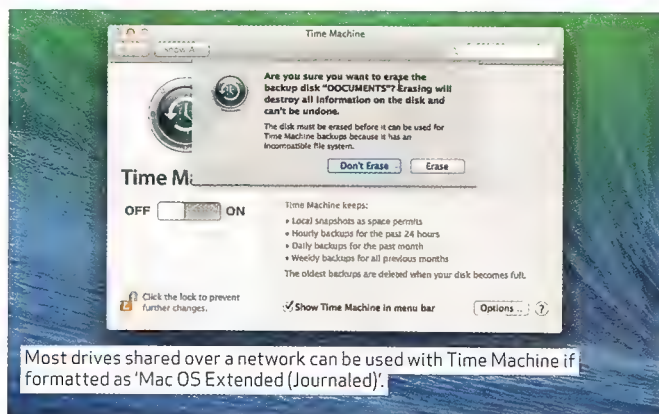
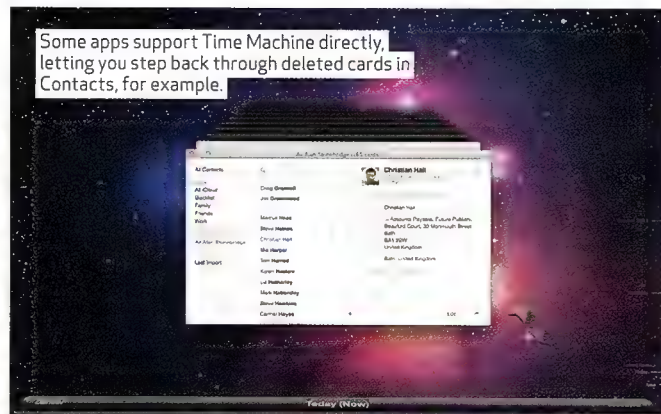
At that point, it will delete the oldest weekly backup.

Time Machine captures the most recent state of data on your disk, and files you've deleted, rather than archiving multiple versions of the same file in a reliable way. If the latter is what you want, then you need to use the auto-save and versioning feature first introduced with OS X 10.7 Lion.

The capacity of the external drive you need depends on your Mac's internal drive, how much of that you expect to use, and how many old backups you want to store. Something twice the size will allow you plenty of room for backups, but you'll probably find that the same size is fine if you don't want to store many old files.

DRIVE OPTIONS

If you have a smaller drive you want to use, you can choose to exclude files or folders from backups. For example, you might decide that since you can always reinstall your apps, backing up the



Applications folder is unnecessary. Folder's contents are also excluded.

Beware that Time Machine doesn't create a bootable copy of your startup disk, which means that in the event of a catastrophic failure you'll need a recovery disk to restore your whole drive from your Time Machine drive. Select your source and the software does the hard work.

In Mavericks (or indeed any machine running OS X 10.7.2 or later,) your Mac can be started up from the recovery partition on your Time Machine drive. Just hold down the Alt key at startup. When presented with a list of startup disks, choose the Recovery system on your backup drive.

Time Machine can use any network-attached storage drive formatted as 'Mac OS Extended (Journaled)' that's connected to your Mac over your local network (but, sadly, not the internet), including (naturally) a Time Capsule. You can also use a USB drive attached to an AirPort Extreme base station, although Apple doesn't support this.

STEPPING BACK

Recovering a file from your Time Machine backup is simple. Select 'Enter Time Machine' from its menu bar icon. Time Machine appears to float the active Finder window above an astronomical background. Behind the current window is a 'stack' of older versions that you can scroll back through to find whatever deleted file you wish to retrieve. In addition, some OS X apps — such as Apple Mail — show their window in the stack when you choose 'Enter Time Machine' while using them. Other default apps that support this include Contacts and Calendars.

Time Capsule is Apple's official way to back up with Time Machine over a network. Many third-party NAS drives work as well.

Restore from Time Machine

Time Machine offers several options for restoring files. Restoring a specific file or folder begins in the Finder. First, go to where the file or folder was on your drive. Next, open Time Machine, and after a few seconds your Finder window will change to reveal what looks like a series of windows stretching back into space. You'll see a timeline on the right-hand side of the screen with dates marked on it. You can scroll back through the stacked windows using the arrows or by clicking a date in the timeline, until you find the file you want. If your startup disk is corrupted, boot your Mac from an OS X installation disk (OS X 10.5 or later) or the Recovery partition (OS X 10.7 or later). Once it's started up, choose 'Restore From Time Machine Backup' — in older versions, look in the Utilities menu. Connect your Time Machine drive and select it. Now, you'll be able to restore your drive, including files and applications. However, Time Machine doesn't back up application cache folders, so when you first run some apps (such as Entourage) it may take a while for them to recreate their caches.

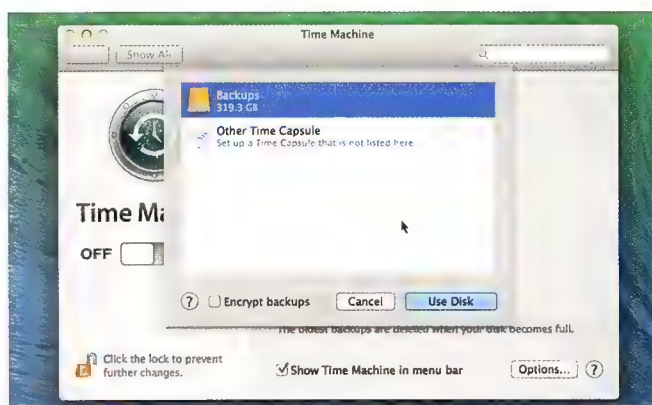
Set up Time Machine

Create a backup for your Mac.



1 STRAIGHT TO PREFERENCES

Click the Time Machine icon in 'System Preferences', or click Time Machine's menu bar shortcut for a direct link. Time Machine prompts you with a link to open its Preferences each time a new Mac-formatted drive is connected.



2 SELECT YOUR DRIVE

The next step is to click the 'Select Disk' button and specify the drive you want Time Machine to back up to. This can be a local drive or any correctly-formatted shared drive on your network — it's entirely up to you.



3 EXCLUDE SOME THINGS

Finally, if there are any folders that for any reason you don't want to back up, then click the Options button to specify them. In this case, we've opted not to back up our Dropbox folder, which we use only for easy file transfers.

Back up your Android device

With so much of our data going mobile, backing up here is critical too. Here's how to automate backup on Android.

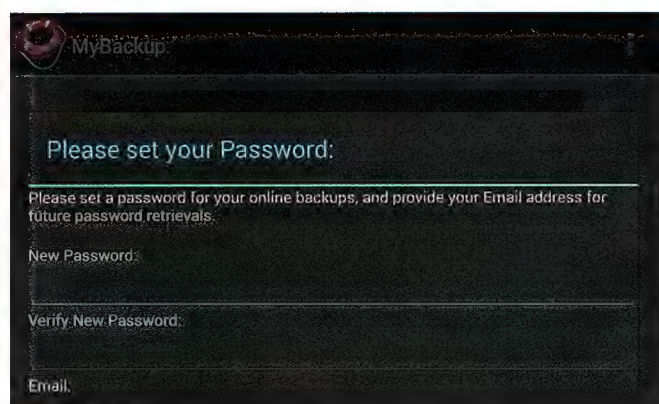
Tablets and smartphones are now an ubiquitous part of everyday life. What with photos, contacts and various files and documents, we are increasingly carrying our entire lives around with us on today's mobiles. They've become as important to us as PCs, but in a far shorter time, and the impact of a lost or broken device has also exploded, which means we should back up our mobiles too.

Making manual backups is dull work, which most of us neglect. Automatic cloud back-up services are great, but they can only be used where there's a secure path to the internet. If you're not using it, however, a spare SD card slot can serve as a back-up location to protect your data from most catastrophes. Here's how to use the free version of MyBackup to automate the process.



Save your data with MyBackup

Automate the boring process of backing up your stuff.



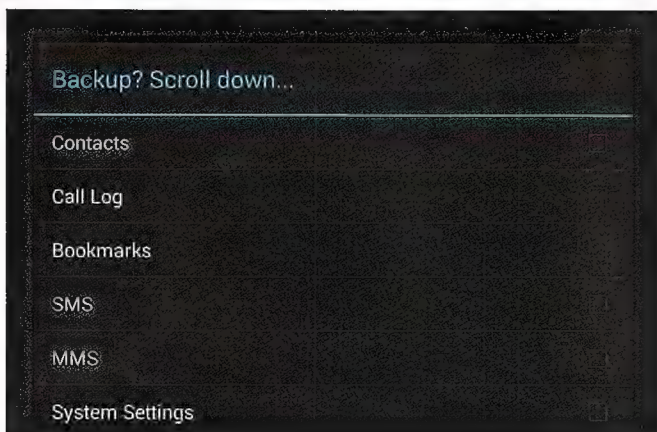
1 INSTALL MYBACKUP

Search for MyBackup in Google's Play Store, click the app's Install button, and then accept the permissions it requests. When you open the app, you are given the option to enter a password to protect the program and its backups, or cancel the dialog box, so type in a secure password and make sure you remember it.



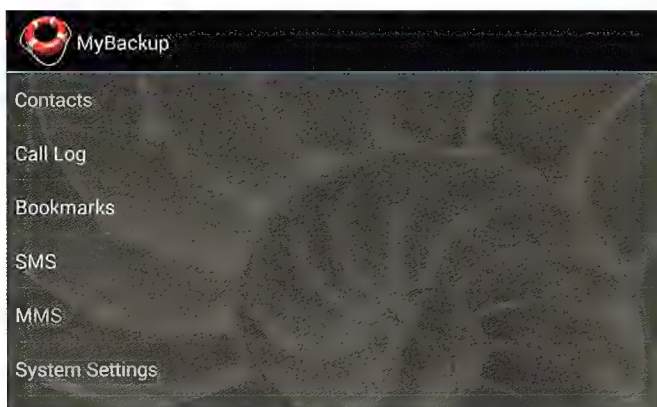
2 RUN IN ROOT MODE

If MyBackup discovers that it can run in root mode on your Android device, click 'Yes' to allow this to happen. The root mode gives MyBackup elevated privileges to read data for backing up that it wouldn't normally have access to, thereby increasing the completeness of the backup it can make of your system data.



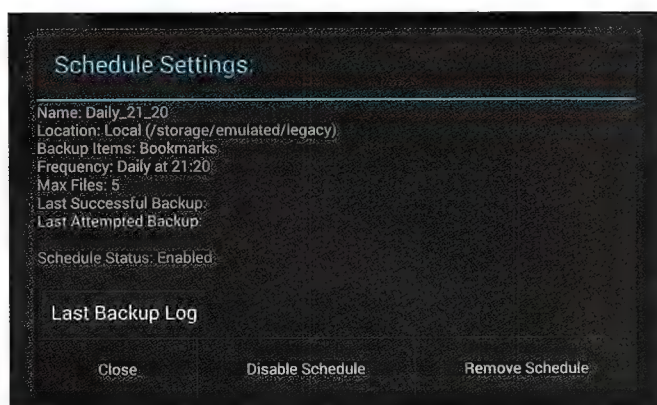
3 MAKE A LOCAL BACKUP

To create a local backup, ensure that an SD card is inserted in your Android device, and then click 'New Backup'. Select Data as the type, and Local. Now select all the data types that you want to add to the archive and click OK. Enter a relevant name for the archive and click OK again. That's it — your data is backed up.



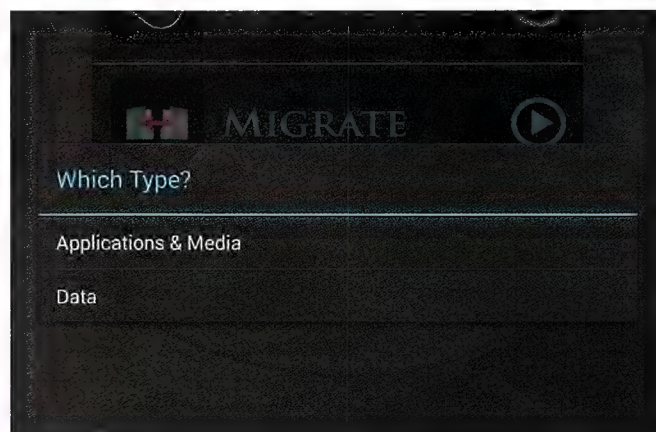
5 MANAGE BACKUPS

You can examine the content of archives to ensure that you are restoring the right one. In 'MyBackups', select an archive and then click View. The list of backed-up categories now appears. Click one and, if it can be displayed, the data within enables you to make sure that you're about to use the correct archive.



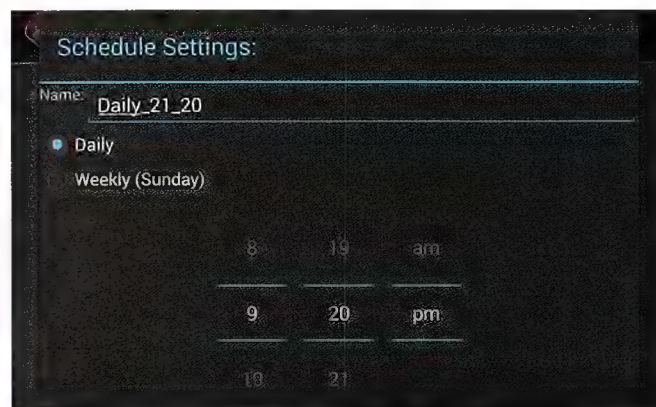
7 DISABLE BACKUPS

You can disable the current back-up schedule or even delete it altogether by going back into Schedule. Select the back-up schedule you want to edit and click either Disable or Remove to carry out each operation. Unfortunately, to edit the time, you have to delete your current schedule and then set a new one.



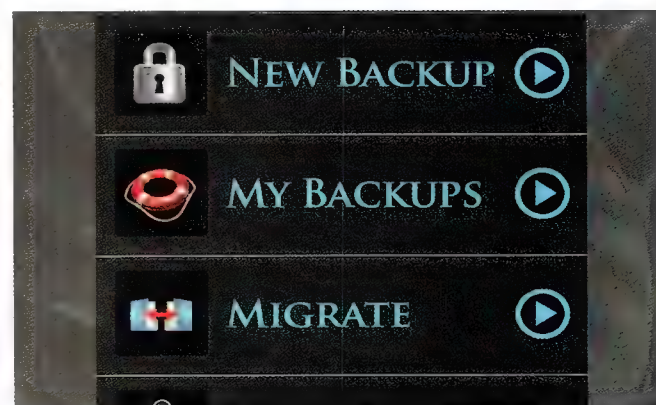
4 RESTORE A BACKUP

If you ever need to restore your backup, click 'MyBackups', then select the type of backup to restore and the local option. Select the archive from the list of names and click Restore. Select the types of data you want to restore and click OK. Confirm the action and the restoration begins. Then reboot your device to complete the action.



6 SCHEDULE A BACKUP

To automate backups so you don't need to worry about remembering to do them manually, click Schedule, and select a local backup. Select all the types of data you wish to save and click OK. Enter a name and time for the backup to occur, and how many previous archives to keep (the default of 5 is fine).



8 MANAGE APPS

You can clear the data stored by apps and even freeze them (prevent them from running) in 'MyToolbox'. Select the type of app (system or non-system) and then choose the apps you want to manage. Freezing stops them from running until they're unfrozen. You can also clear their cached and stored data, or uninstall them.

Using iCloud

Back up your iOS device and sync with others via Apple's servers.

Apple offers a free internet-based backup and sync service called iCloud. Instead of making a backup on your Mac or PC, iCloud can automatically back up your contacts, calendars, notes, bookmarks and other data, and store it all securely on Apple's online servers. All this will then be seamlessly synced with all your iOS devices and your Mac (or PC, if you download and install a free Control Panel from Apple), and you can also access it via the web — see below.

iCloud backs up and syncs all your device settings, Messages and app data, including Notes, saved games, Calendars and Contacts. In Safari it syncs your bookmarks and reading list, and even the tabs open on your iOS devices or your Mac. All your music, app and book purchases, plus app updates, can be downloaded automatically to all your iCloud-linked devices (enable this in 'Settings > iTunes & App Store'), or you can re-download any purchases individually for free on any device when you log in with the same Apple ID. iCloud will even sync playback: if you start to play media on one device and stop, all your other devices resume playback from that point; in iBooks notes and bookmarks are synced too.



PHOTO STREAM

Another feature is Photo Stream, which will automatically upload any photo you take with any of your iOS devices and make it available on all your other devices. It stores up to 1,000 shots, and you have 30 days to move a shot from your Photo Stream to an album if you want to keep a copy on a device other than the one it was shot on. (On that device it remains in your Camera Roll unless you delete it yourself.)

You get 5GB of storage space for free, and you can buy more. But only files and data count towards this quota, not your Photo Stream or any items bought

from iTunes, the App Store or iBook Store. iCloud also incorporates Find My iPhone/iPad: if your device goes missing, you can locate it on a map, send a message to appear on its screen, or wipe it remotely.

You get the option to sign up to iCloud as part of the process of setting up a new iOS device, or you can activate it by tapping 'Settings > iCloud'. Enter your Apple ID and password, which is also your login for iCloud. iCloud also offers email, but you need to turn this on in the iCloud settings screen, then go through the steps to create an @icloud.com email address.

Visual guide: iCloud on the web

Access your key data using a browser.

1 Your user name
Once you've enabled iCloud on your iOS device, it's also accessible at **www.icloud.com**, so you can access key data from any internet-connected device or computer by signing in with your Apple ID.

2 iCloud email
If you've set up an iCloud email account, you'll be able to read its mail here. This won't give you access to other email accounts you may use, however, such as Gmail.

3 Contacts
Sync your contacts with iCloud and you can click here to view them. If you lose your iPad or iPhone you can even restore all your contacts to a replacement device, using the data held in iCloud.

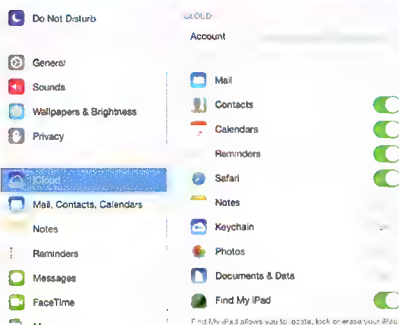
4 Find My iPhone/iPad
If you've enabled this in the settings, you'll be able to click here to see the last-known location of your iPhone or iPad on a map.

5 iWork in the Cloud
If you use any of the iWork apps on your iPad or iPhone, you can have files saved online too. Just enable iCloud sync in each app's own settings, plus Documents & Data in iCloud's settings. You can then access your saved files here, as well as edit them within the browser, even on devices that don't have the apps installed.



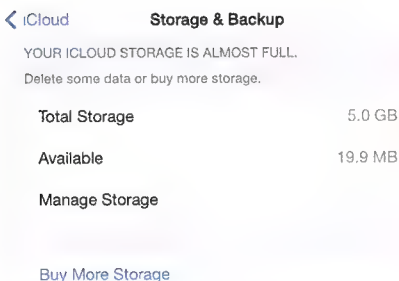
Master your iCloud backup settings

Know what and how to backup on your Apple devices.



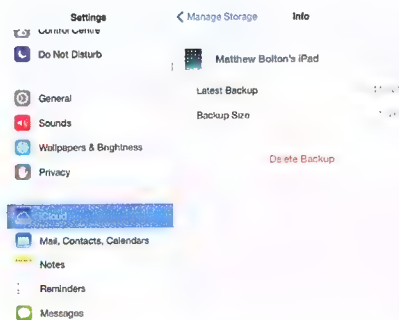
1 CLOUD SETTINGS

Tap 'Settings > iCloud' and, if you didn't enable iCloud during setup, you can do so now. Decide which iCloud services you want to switch on. Choosing Mail won't sync all the email accounts you may access via the Mail app, only your free @icloud.com account.



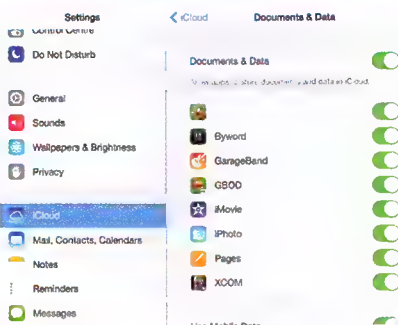
4 BUY MORE STORAGE?

The Storage & Backup screen will tell you how much space your devices are using. If you need more, you can tap Buy More Storage. An extra 10GB (making 15GB, including your initial free 5GB) is \$21 a year, 20GB extra (25GB total) is \$24, and 50GB extra (55GB total) is \$105 a year.



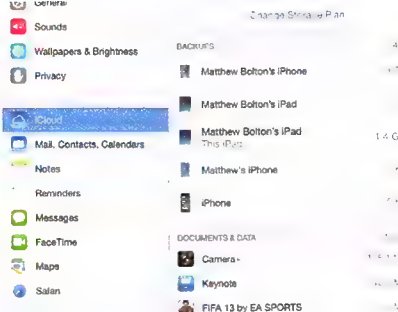
7 OTHER DEVICES

For devices other than the one you're using, you can't view this level of detail but you can see when it was last backed up and how big the backup is. You can also delete any device's backup, but think carefully before you do this, especially in the case of other devices!



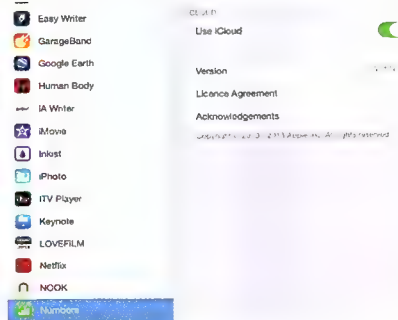
2 DOCUMENTS & DATA

Tap Documents & Data to enable your apps to use iCloud to store documents you create and other data such as saved games, high scores and so on. You can also choose whether it uses a Mobile (cellular) connection if Wi-Fi is not available — watch any data cap on your plan though!



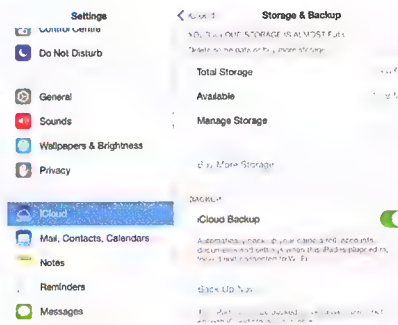
5 OR OPTIMISE FIRST

But do you really need more? Tap Manage Storage to see your devices that use iCloud backup. You'll get another option to change your storage plan, but instead you can tap the name of a device to see details of what data on that device is being backed up.



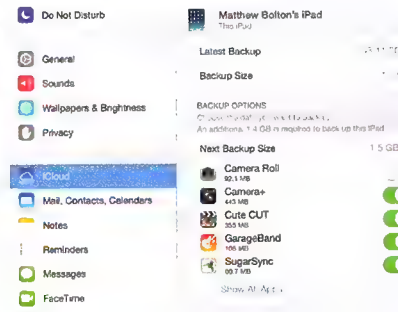
8 ACTIVATE APPS

If you're using iMovie or any of the iLife apps (Pages, Numbers and Keynote), make sure to tap each one in Settings and enable iCloud there as well so that your documents are saved to iCloud, accessible at icloud.com and synced on all your linked computers and devices.



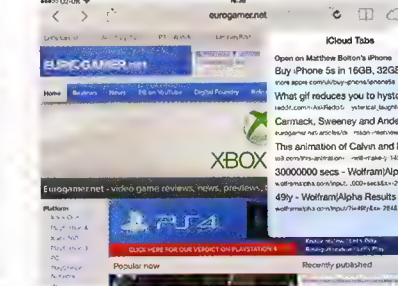
3 STORAGE & BACKUP

To enable iCloud Backup and switch this on. Your iOS device will no longer sync and back up automatically to iTunes. Instead, it will back up to iCloud when switched on and connected to Wi-Fi. You can also tap 'Back Up Now' to back up manually.



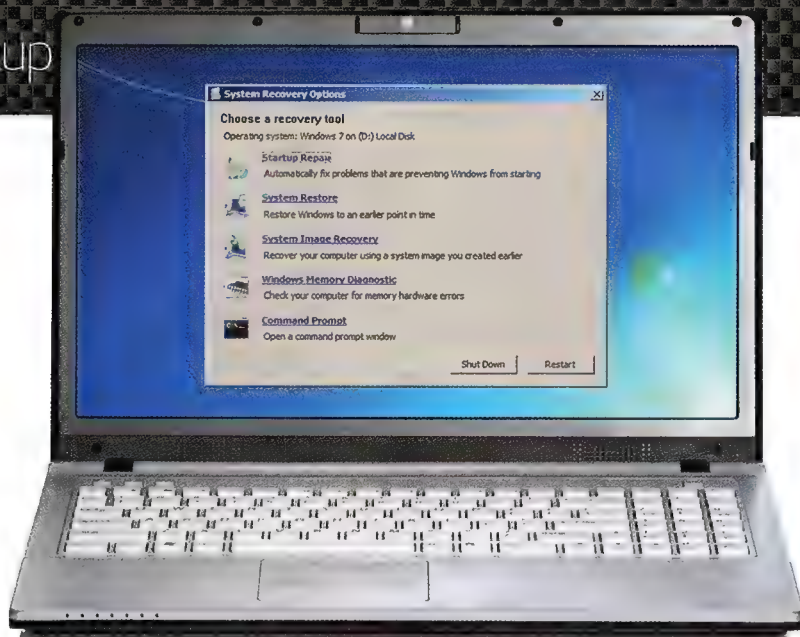
6 SPECIFY BACKUPS

To save space and stop backing up items you don't really need, you can turn each app's backup on or off. Tap 'Show All Apps' to see smaller apps. iOS apps store user data internally, so Camera Roll contains all the pics you've shot, iBooks all the books you've bought, and so on.



SAFARI TAB SYNCING

If you use Safari on iOS and Mac, you can sync any open browser tabs across all your devices and computers, as long as each is connected to the internet and signed into your iCloud account. In Safari on your iOS device, tap the cloud icon at top right to see a list of the tabs open on other devices.



Make a Windows 7 system repair disc

The worst computing disaster is one that prevents Windows from loading, and can stop you from accessing critical files. Mike Williams is here to show you how to prepare for, and deal with, an apparently unbootable PC.

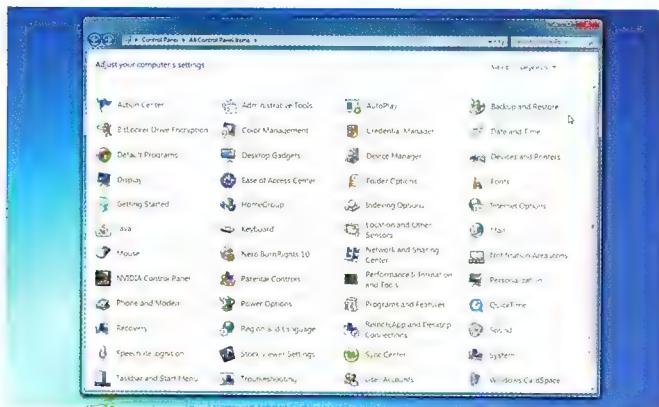
The worst moments of our computer lives are all based around the same situation: After turning the system on, Windows absolutely refuses to start. Are our machines useless heaps of junk? Have we lost all of our important files, photos and information? It's a horrible feeling.

Fortunately, if this happens, it is possible to boot from a Windows 7 installation DVD. In this situation the Repair function can be used to swiftly get the computer going again. But if you don't have an installation DVD, or it's lost or scratched, you'll be in trouble. And that's why you need to be prepared for when disaster strikes.

Follow this helpful guide and in less than five minutes you'll have a Windows 7 system repair disc that can be used to start an unbootable computer, and usually get it working again. Just don't forget to keep it in a safe place so it's easily accessible.

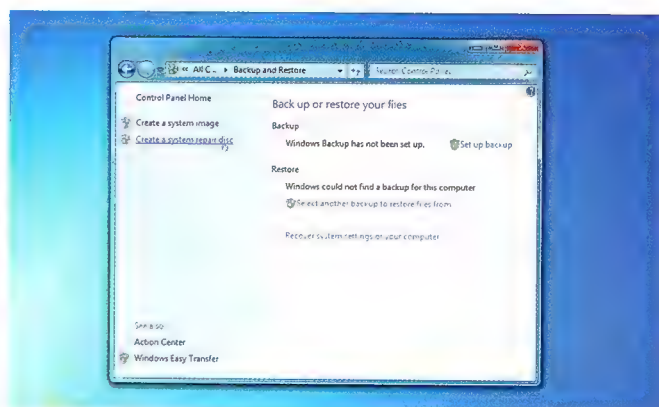
Creating a Windows 7 repair disc

Have one on hand in case disaster strikes.



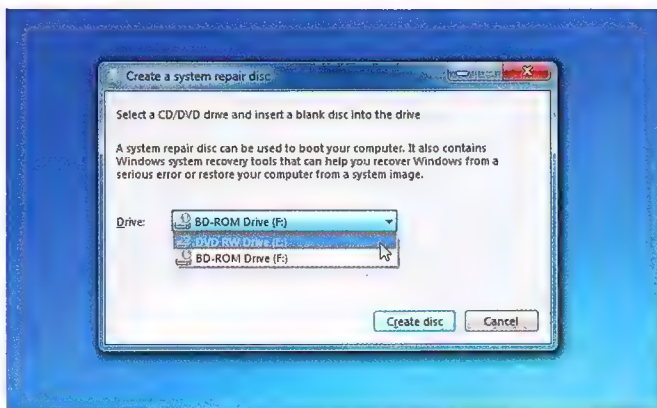
1 EXPLORE CONTROL PANEL

Click on the Start button and then select the 'Control Panel' option. If the View by option is currently listed as Category, click on the arrow to its right and select the 'Large icons' option instead. This will enable you to see all of the available applets on one screen. Find the 'Backup and Restore' applet, and then double-click on it to launch it.



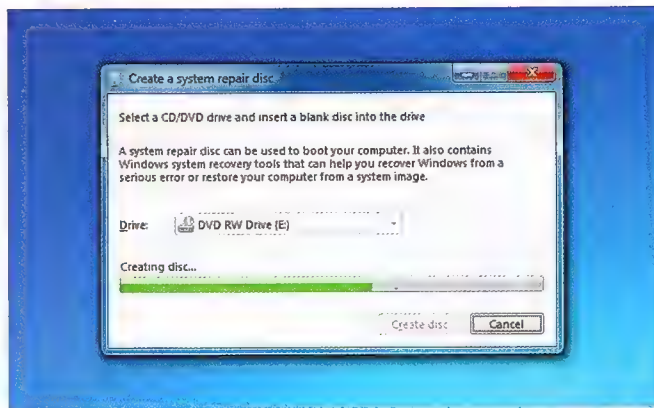
2 LAUNCH THE DISC CREATOR

On the left of the window you will see the 'Create a system repair disc' option. Click on this to run the program that you need. However, if you do not see this option, it is possible to launch the repair disc tool separately. Click on the Start button again and type `recdisc` into the Search box. You can then click on the `recdisc` link to fire up the program.



3 FIND A DISC

Grab yourself a blank disc — it can be either a CD or DVD, it doesn't matter. Carefully place the disc into one of your computer's optical drives. Once the 'Create a system repair disc' program has started up, click on the drop-down menu arrow and select the drive that contains your disc, as shown above. Click on the 'Create disc' button.



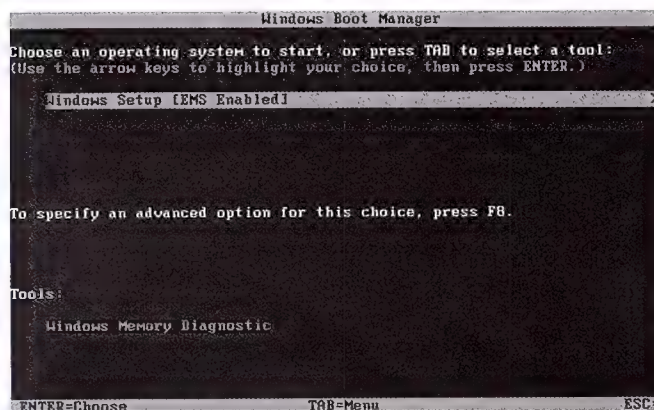
4 CLICK AND BURN

Once you have clicked the 'Create disc' button, the program will start to burn all of the system recovery files on to your CD or DVD. This shouldn't take long — on the computer we tested it took less than one minute. Then, as the program suggests, label the disc as 'Repair disc Windows 7' so it will be easy for you to identify it later.



5 TEST CAREFULLY

It makes sense to test the disc immediately to ensure that it works correctly — this only takes a moment. Leave the disc in the drive, close any open applications and then reboot your computer. If Windows loads as normal, change your BIOS set-up program to boot from your optical drives first. Check your computer's manual for more advice on how to do this.



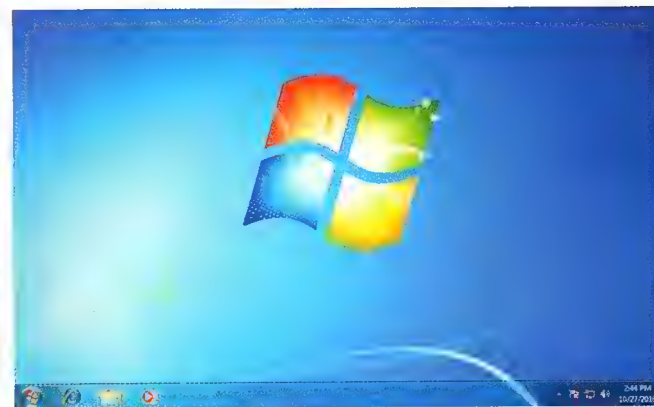
6 BOOT IT UP

When your computer is correctly booting from your repair disc, you may see a message that informs you to press any key to boot from a CD or DVD. If you do see this message, just tap the Space bar immediately and the repair disc will continue to load. When you are shown a menu, select the 'Windows Setup [EMS Enabled]' option, as shown above.



7 SYSTEM RECOVERY OPTIONS

Select your keyboard and click the Next button. Select your Windows installation, then Next again. You will now see the recovery options. If Windows 7 ever won't start, boot from this disc, click the 'Startup Repair' option and Windows should get your computer automatically working again.



8 READY FOR (ALMOST) ANYTHING

You now know all about the Windows 7 Recovery Disc creation tool. If you've completed these steps, well done — you're protected. If Windows 7 ever refuses to start, you can always launch the Recovery Disc, then use 'System Restore', a backup or 'Startup Repair' to fix the problem and get everything back on track without losing too much precious time.

Recover data if your PC fails

Can't boot into Windows? Before attempting physical repairs, Nick Peers shows you which steps to use to back up and protect your data.

What happens if you can't boot into Windows? If — as in most cases — the hard drive itself hasn't physically died, then your data is tantalisingly close, but just out of reach. Attempting repairs could make things worse, but if you follow this tutorial you'll be able to back up all the data on your drive using a free program called Macrium Reflect Free before you try to fix the problem.

The tutorial assumes you're unable to boot into Windows, in which case you'll need access to another Windows PC. You'll also need an external USB hard drive to recover your non-functioning drive's files to, plus rescue media in the form of a blank CD/DVD or spare USB flash drive (512MB in capacity or greater).

Even if your PC is working perfectly at the moment, why not protect yourself by following the first six steps to create the all-important rescue media? It could save your files one day.

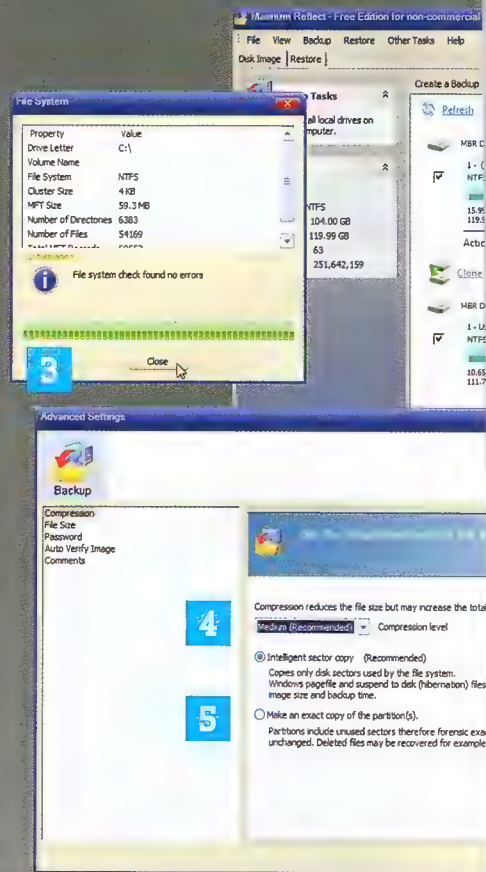
Jargon buster

Forensic image

A complete byte-by-byte backup of an entire hard drive. This includes all free space where deleted files may reside, making it possible to recover them later.

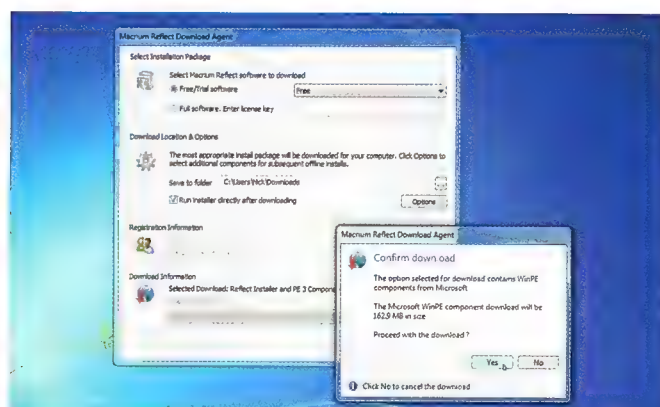
The process of accessing a drive image by making its contents accessible through Windows Explorer. The image is assigned a drive letter and works like a virtual hard drive.

The version of Windows — either 32-bit or 64-bit — used by your rescue media. This should match the version of Windows installed on your non-booting PC.



Rescue your data

Get your stuff back!



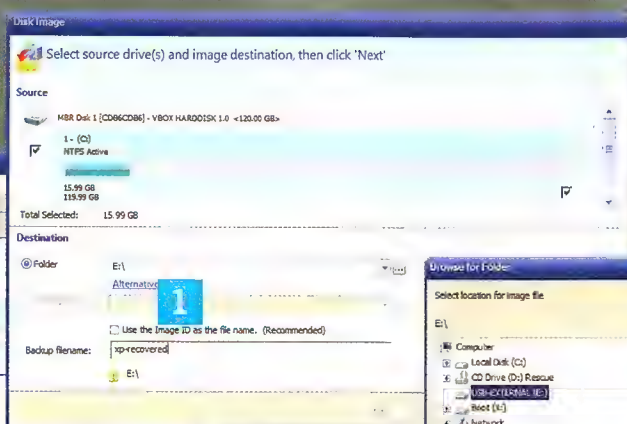
1 INSTALL MACRIUM ON A WORKING PC

From your working PC, first open a web browser and go to www.macrium.com/reflectfree.asp. Click the green download link followed by 'Download now'. Save the file reflectdl to your hard drive, then double-click it to launch the installer. Make sure the selected download is the free version with PE 3 components, then click Download and follow the prompts to install the program.

2 CONNECT AN EXTERNAL DRIVE

You'll need an external USB 2.0 hard drive to store the recovered data. It needs enough free space to hold the contents of the entire PC — Macrium will compress the backup, but it may not be enough. A new 1TB hard drive costs around \$80, and is a worthwhile investment. Plug your USB hard drive in to the working PC, which will detect it and install the necessary drivers.





1 The entire contents of your recovered drive are stored in one file, called a drive image. Untick this box to give it a more easily identifiable name, such as xp-recovered.

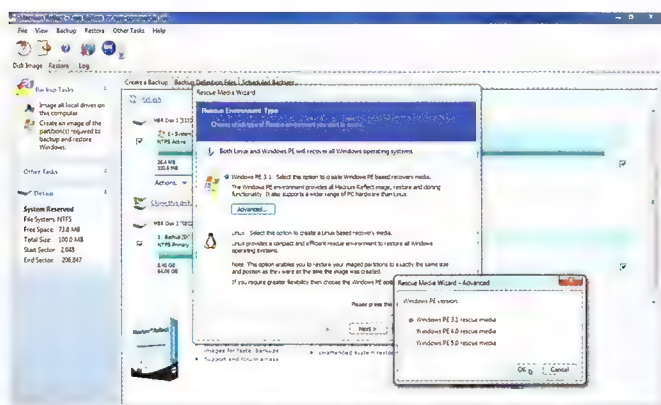
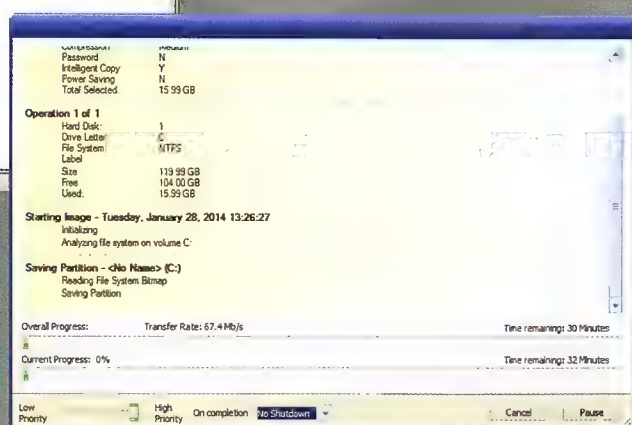
2 After clicking 'Image this disk', click the '...' button to select your external USB drive or a folder within it as the place to store your backup.

3 You can quickly see if the troublesome PC's drive is in good working order before backing it up — click Actions under the drive and choose 'Analyze file system'.

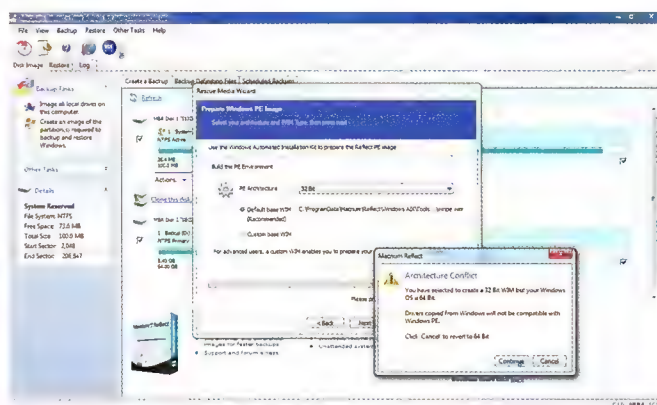
4 After clicking Next to view the summary screen, click the 'Advanced Options' button for more options. Start by reviewing the compression options — if space is tight, set this to High.

5 Pick the 'Forensic' option to take an exact copy of the entire drive for advanced data recovery purposes. Note, however, that standard images are smaller and quicker to create.

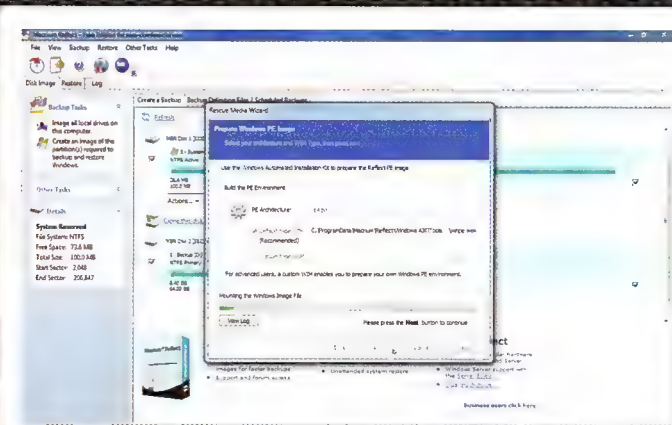
6 Once you're ready, close Advanced Options and click the Finish button. Macrium will now back up your non-booting drive's contents to your external hard drive.



3 LAUNCH RESCUE DISC CREATOR With the USB hard drive still plugged in, click Start and select Reflect to launch the program. Open the 'Other tasks' menu and select 'Create rescue media'. The Windows PE option should be selected, so click Advanced and choose the 4.0 option if your non-booting PC came with Windows 8 installed. Otherwise, select 3.1 and click OK followed by Next to continue.

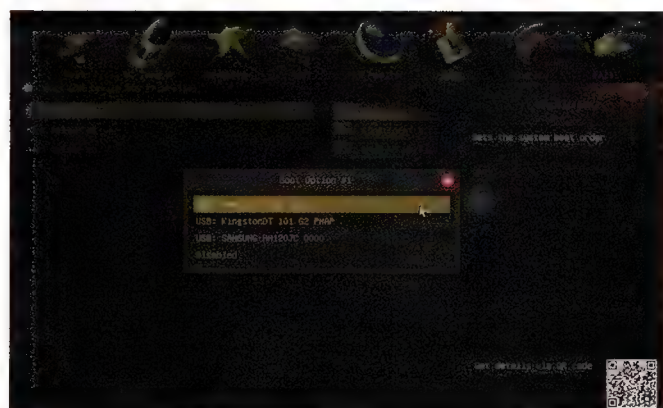


4 SELECT PE ARCHITECTURE The PE Architecture is one of the most important choices you have to make. Usually the default setting (typically 64-bit on newer PCs) is the right one to pick, but if your non-booting PC is running Windows XP, select 32-bit instead. Ignore the Architecture Conflict warning that pops up by clicking Continue. Leave 'Default base WIM (recommended)' selected and click Next.



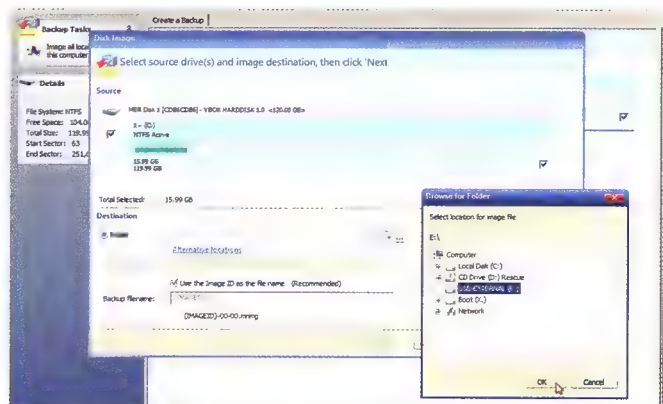
5 BUILD RESCUE FILES

Click Next and wait for the files to be collated, then click Continue. You may receive two warning messages — one that says 'Check your rescue media can access your drives' and one telling you about an update that requires upgrading. Click Continue to ignore them. If you're returned to the PE Architecture screen from here, just click Next to repeat the step.



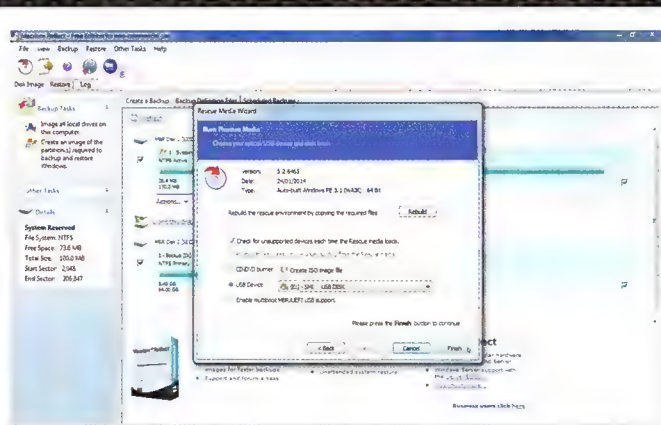
7 START THE NON-BOOTING PC

Next, plug the external hard drive into your non-functioning PC and power it up with the newly made rescue disc or USB flash drive inserted. If prompted, press any key to boot from CD or DVD. If no media is detected, restart your computer and look for an option to select the boot media. Press this key and choose your CD/DVD drive or USB flash drive from the list.



9 CREATE YOUR DRIVE IMAGE

The annotated screenshot above reveals all the options for backing up your hard drive (known as drive imaging). These include creating a forensic image if you need to recover previously deleted data from your inaccessible drive, and choosing a more easily identifiable name for the drive image itself. Work your way through the wizard, then click Finish.



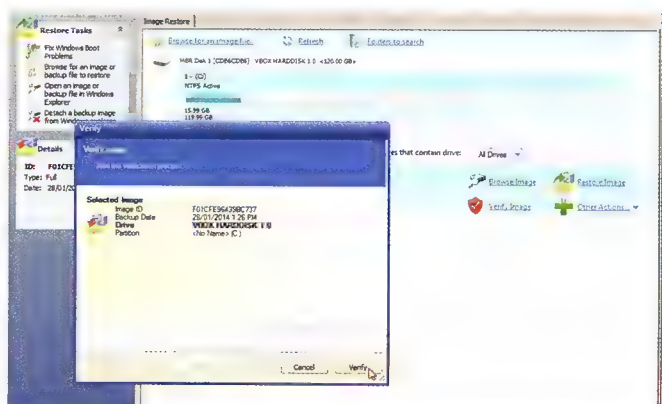
6 CHOOSE RESCUE MEDIA

You should now be prompted to burn your rescue media — either CD/DVD (insert your disc) or USB. If you're using a USB flash drive, make sure you tick 'Enable multiboot MBR/UEFI USB support' if you're trying to recover data from a newer PC with Windows 8 pre-installed. Click Finish to create the rescue media, then eject the disc or safely remove the flash drive.



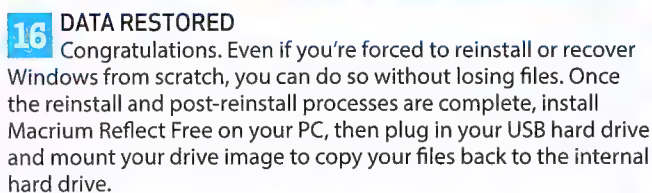
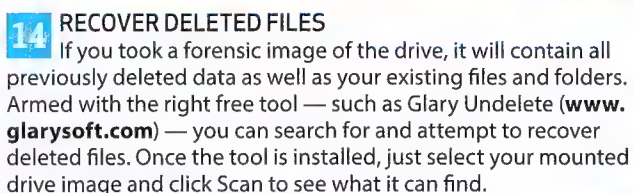
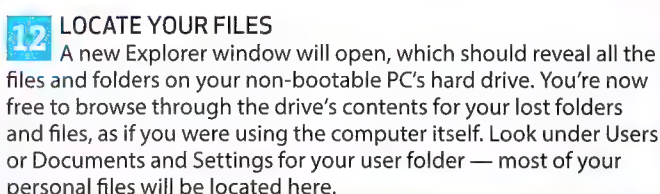
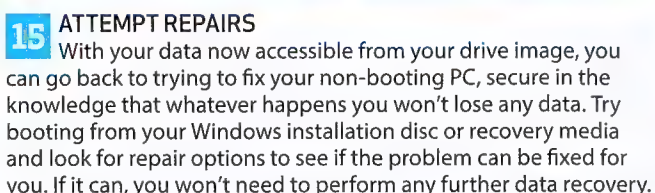
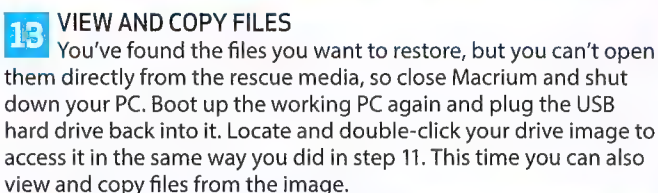
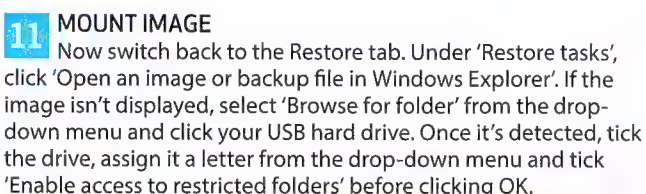
8 LOAD MACRIMUM REFLECT

After a short pause the Macrium Rescue Environment should start. If you're prompted to load drivers — typically network ones — you can click No. You don't need them to detect your external hard drive. When the main screen appears, switch to the Disk Image tab. You should see both your internal, non-booting hard drive and the external drive you plan to recover data to.



10 VERIFY BACKUP INTEGRITY

When the process is complete, click OK followed by Close. Switch back to the Restore tab, where the drive image should now be displayed. Make sure the image isn't corrupt by clicking 'Verify image'. Click Verify and wait a moment for Macrium to check the image and confirm that it is intact. When this has been successfully verified, click OK followed by Close.



feature » the truth about bloatware



THE TRUTH ABOUT BLOATWARE

Research shows that unwanted programs installed on new PCs can slow your computer by over 40%. So, why are they there and how can you get rid of them?



Buying a new computer should be a thrill, prompting all manner of exciting questions when you eagerly unbox it, such as, "What amazing new tricks can it perform for me?" Unfortunately, you may find yourself asking a few less encouraging questions. "Who stuck all those icons on my desktop?" you may wonder as you boot up your brand new machine. "What's with all the pop-ups, and why is everything so slow?" Welcome to the less than wonderful world of bloatware – all of the software on your new PC that you didn't ask for. It's a term that is as accurate as it is unflattering.

YOU'VE BEEN BLOATWARED

In a crowded, ultra-competitive market, computer manufacturers operate with razor-thin profit margins, and as a result they'll do pretty much anything to make a few more pennies on a sale – and software firms are happy to pay if the PC-makers will stick a few programs on your hard drive.

Unfortunately for us, that can turn the joy of owning a new PC into something altogether more sour – installing programs you don't want means you end up sacrificing hard disk space and PC performance for products you didn't ask for and don't intend to use. At best, all that unwanted software can take up space you'd rather use for other things. At worst, it can make

Windows look rotten, get on your nerves and slow down your new PC.

Over the next few pages we'll discover what it is, who's responsible – and how to get rid of it.

A NEW PHENOMENON

You've got to admire the computer industry's nerve. A few years back, when commentators – including some senior Microsoft executives – suggested that pre-installed software often bunged up otherwise decent new computers, Sony offered to remove it – provided the consumer was prepared to pay an extra \$50 for the privilege of what it called a 'fresh start'. Predictably, widespread public mockery forced Sony to bin that particular money-spinner.

Fast-forward to 2013 and some hardware manufacturers – Apple being perhaps the best example – offer computers with little or no pre-installed software. But the odds are that if you buy a new computer – particularly at the budget end of the market – you'll have to spend time uninstalling programs you neither want nor need; time that you'd rather spend getting to grips with what your new device can do.

The phenomenon of bloatware has now become so widespread that it is even being used as a selling point by some canny manufacturers. For example, Microsoft's Signature line of laptops are sold in the US – somewhat disingenuously – on the basis of their

the truth about bloatware

bloatware-free experience. According to Microsoft, the difference between a Signature PC and a non-Signature one makes compelling reading. Compared with a “cluttered, trialware-filled, slower-than-should-be laptop”, an optimised Signature computer goes to sleep 23.1% faster, starts up 39.6% faster and resumes a significant 51.3% more quickly.

It's a good idea to take such claims with a hefty pinch of salt. Microsoft's Signature laptops still come with a bunch of software, including Adobe Reader, Windows Live and Microsoft Security Essentials, and the Signature scheme also involves optimising Windows itself — but there's no doubt that unwanted programs can have a massive effect on your PC's performance.

A NECESSARY EVIL?

But is all pre-installed software actually bloatware? There's no doubt that some factory-fresh PCs come stuffed with stuff — with some programs more useful than others.

For example, Samsung's Series 7 Gamer laptops come with the genuinely useful Windows Live suite, Skype, Acrobat Reader and Office Starter 2010 installed. However, some of the other additions are debatable; CyberLink Media Suite, CyberLink YouCam and Samsung's Control Center are simply

extra programs that perform simple Windows functions.

As another example, HP's sleek Folio 13 Ultrabook is supplied with HP Setup Manager, Support Assistant and Recovery Manager, together with HP Launch Box, HP Rara Music, Adobe Reader and Adobe Flash Player. All are vying for your attention — and none are of much value to the user.

Antivirus trial versions — such as Norton Internet Security found on Lenovo's G570 — are common, and pop-ups will annoy you until you either

We approached the biggest names in pre-installed software to ask what benefits the practice of bundled programs brought us: tellingly, they declined to comment. That's a shame, because while some pre-installed software is nothing more than a pain in the backside, some of it is useful.

Microsoft's bundled Office Starter, for example, enables you to work on Word documents without buying the package. However, manufacturers need to be selective about what they include, so as not to ruin consumers' first hours with their brand new PC.

“There's no doubt that unwanted programs can have a massive effect on your PC's performance.”

WHAT TO DO WITH THE PROGRAMS YOU DON'T WANT ON YOUR PC

Pre-installed programs might

delete the software or cave in and buy the package.

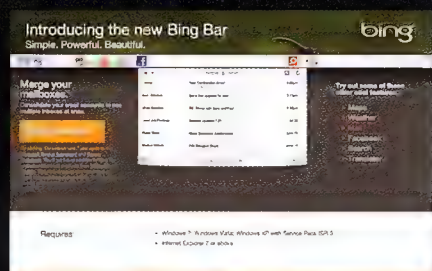
So, who wins? Unfortunately, not you. Often, to compensate for thin profit margins, manufacturers are paid by the software firms to install the programs. It's good news for the software firms too, because pre-installed software can be a powerful form of marketing. So, if your PC is already running a 30-day trial of SuperSafe Security SafeSuite Pro, then a few scary pop-ups at the end of the trial period — “SuperSafe Security SafeSuite Pro expires tomorrow and then your computer will explode, so buy now,” — can easily result in a sale.

not have cost you any money, but they do still come with a price attached, and that's the burden they put on your PC. They take up space, waste your time by annoying you with pop-ups and update reminders, and most importantly of all, they can significantly affect the performance of your new computer.

If your PC has to load lots of additional programs when it starts Windows, that's obviously going to increase the boot process — and if it's carrying lots of extra data in RAM, then that's going to have an impact on your PC's overall performance. This effect is particularly noticeable on computers that don't have much memory, or whose

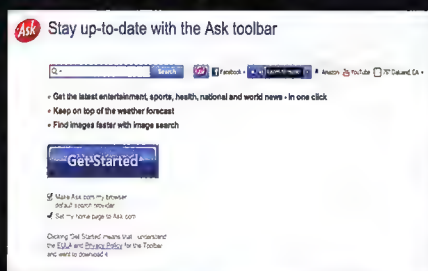
SIX OF THE WORST

PC Decrapifier is designed to remove unwanted Windows programs. Its creators publish a list of the most commonly removed software. These are the top six...



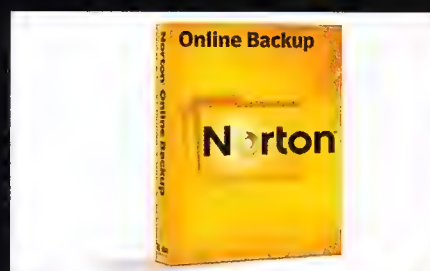
MSN TOOLBAR

Microsoft's browser add-on has since been renamed — it's the Bing Bar now — and in its MSN incarnation, it was removed by 54% of PC Decrapifier users whose software detected it. Toolbars are a particular bugbear for PC power users as they clutter up the screen and encourage you to use the toolbar maker's services.



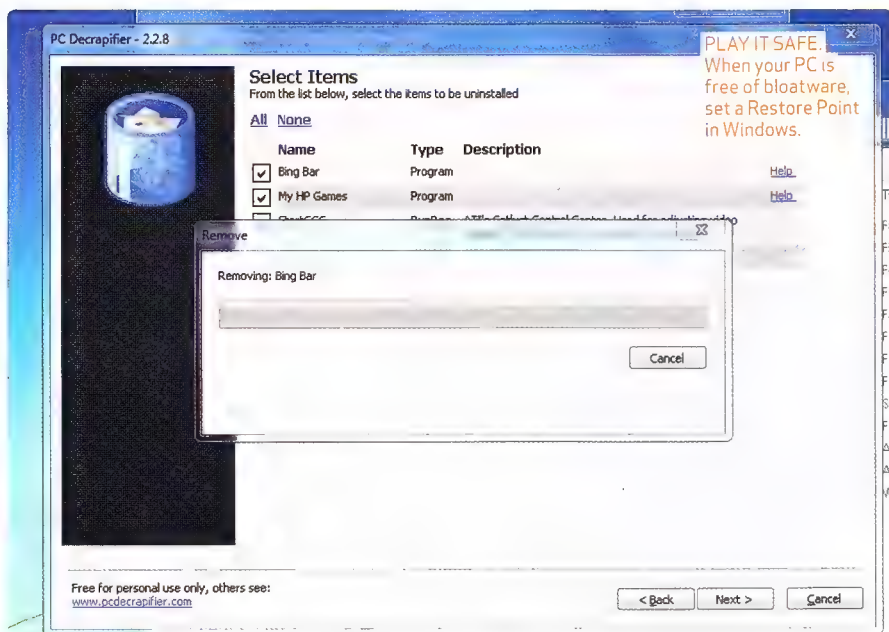
ASK TOOLBAR

37% of PC Decrapifier users got shot of this one, and like the MSN Toolbar, it does a good job of adding more buttons to your browser in case you forget how to use bookmarks or type Amazon or Facebook in the search bar. Ask's version was classified as malware by at least one security program.



NORTON ONLINE BACKUP

When it was detected, some 68% of PC Decrapifier users voted to remove this piece of software. It's not a bad program by any means — as the name suggests, it's a utility for backing up key files online — but it's a free trial, not a free product, so be aware that it will cost you after your first month.



owners use them for memory-intensive tasks. In other words, the harder your computer works, the more of an impact unwanted applications are likely to have on its performance.

So, if you're looking to remove some of the useless programs on your new laptop, the charmingly named PC Decrapifier is a great place to start. This free utility, which you can download from pcdecrapifier.com, is designed to automatically recognise repeat bloatware offenders and remove them. This is particularly useful if you're unsure about which programs are safe to delete, and need a helping hand.

Otherwise, if your computer is stuffed with programs you don't want and you've got a Windows installation DVD handy, the solution is simple: back up your files and reinstall Windows.

However, in most cases things are a little bit more complicated than that,

especially when it comes to laptops.

If your laptop manufacturer has given you a system restore program to make your own installation discs, as many of them do these days, that means it'll restore your system to its original factory condition — and therefore also resurrect all the programs you were trying to delete in the first place.

Thankfully, it seems that some hardware companies are beginning to see the light. For example, some recent HP computers provide you with the option to run a minimised image recovery, which gives you Windows and your essential drivers, but doesn't include any of the various additional — and unwanted — applications.

As you'll see from the panel below, there are stacks of utilities you can use to get rid of these unwanted applications. But if you'd rather not go through that whole routine all



PESTER POWER Although it's a good program, trials of software such as Norton simply want you to pay for services.

over again, then once you've got your PC just how you like it, you have two main options.

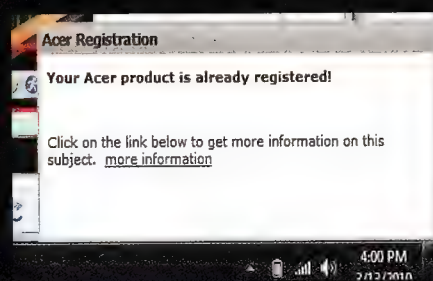
The first is to use System Restore to create a new restore point, which you can use to travel back in time whenever you want to reset your PC, and the second is to use a third-party program such as Acronis True Image (\$69.99 from www.acronis.com.au) to create a disk image on an external drive or DVD.

This effectively clones your computer, enabling you to reinstall your entire PC from the clone whenever you need it. It's much, much quicker than reinstalling Windows from scratch, then downloading endless Windows Updates and then removing all the software the recovery disks put back on your PC.

IN CONCLUSION

In a time of tight margins, we can understand why manufacturers add paid-for software to new machines. However, they seem oblivious to the fact that it sullies that special experience of a brand-new PC.

We're begging them all — cut out the rubbish, put the focus on quality, and people will respond by opening their wallets.



ACER REGISTRATION
Some 76% of users opted to remove this one, and 100% of them were Acer owners. This is a manufacturer-specific program that keeps popping up, asking you to register your PC. In many cases, it continued to pop up every hour or so even after users had registered their laptops. Grrr...



TIMES READER
The New York Times's application is one of those programs that seems like a good idea until you use it. While it does a nice job of delivering a digital newspaper, most of the content is locked behind a paywall. Accordingly, 58% of PC Decrapifier users booted it off their PCs. We hope the NYT is listening.

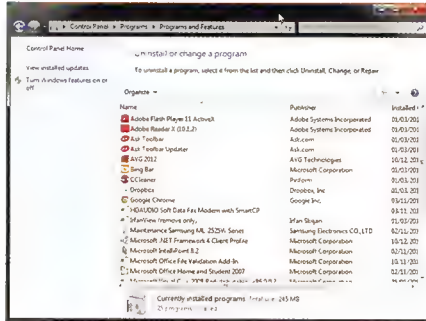


PDF COMPLETE
PDF readers often appear high in bloatware charts — the programs can be massive, and they're often overkill for opening the odd PDF file — and 87% of PC Decrapifier users opted to remove this particular one. It's a trial version of a corporate PDF application that can often be found pre-installed on HP laptops.

the truth about bloatware

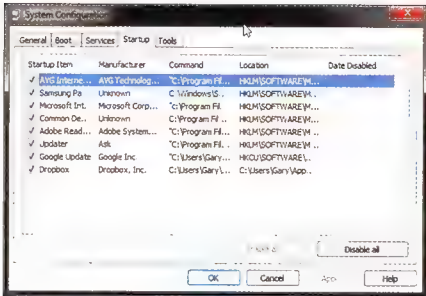
CUT THE CRAP

Even the most cluttered computer can be tamed, and tamed quickly. All you need are the right Windows components and applications. These are our six favourite PC pruners.



1 CONTROL PANEL

Unlike malware writers, reputable software firms don't usually hide their applications from Windows, so in many cases, removing unwanted programs is just a matter of heading for 'Control Panel > Programs > Programs and Features', selecting the program you want to get rid of and clicking 'Uninstall'.



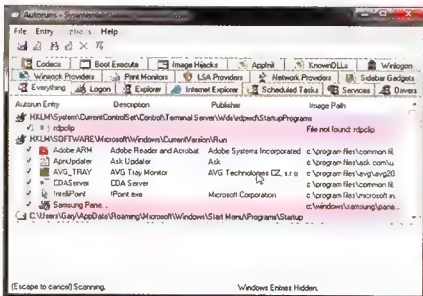
4 MSCONFIG

Programs that run automatically whenever you boot Windows can be an enormous pain in the backside, and Windows has a built-in tool you can use to find and disable them. Click Start, search for MSConfig and then click on the 'Startup' tab. You can now disable anything you don't want.



2 PC DECRAPIFIER

Where Control Panel lists everything it finds installed on your PC, dedicated rubbish removers such as PC Decrapifier (www.pcdcrapifier.com) only flag up programs they think you'll want to get rid of. That's good if you want something simple, but it does mean that some programs can be missed.



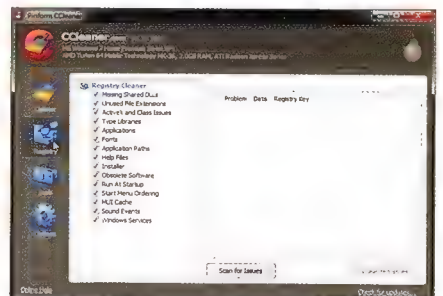
5 AUTORUNS

Fancy something more powerful than MSConfig? Autoruns (technet.microsoft.com/en-us/sysinternals/bb963902) is one of the most comprehensive start-up monitors. If it's running when your PC starts up, Autoruns will find it. It hides essential Windows bits so you won't disable anything by accident.



3 REVO UNINSTALLER

The \$39.95 Revo Uninstaller (www.revouninstaller.com) can remove stubborn programs other uninstallers can't, and it can remove the leftovers, too, such as installations. It's a powerful all-round PC cleaning product, and there's a 30-day free trial that you can use to put it through its paces before you buy it.



6 CCLEANER

Like Revo, CCleaner (www.piriform.com/ccleaner) is a comprehensive Windows cleaner that removes unwanted files, cleans up the leftovers from previous uninstalls, zaps temporary files and helps protect your privacy. It's very quick and, unless you want tech support, won't cost a cent. A great program worth keeping on your PC.

THE FINAL WORD

Profit margins are slim, manufacturers have to make a profit somehow.

Not all pre-installed software is bloatware, but there's no doubt that some hardware firms are a little too enthusiastic when it comes to giving us goodies we don't really want. Imagine if cars were sold the same way as PCs — you would have to spend hours removing furry dice, pink seat covers and 8-track cartridge machines the moment you got your hands on the set of keys.

Things have improved — thankfully, the days when PCs were plagued with genuinely awful bloatware have largely passed — but there's still a very good chance that your shiny new PC will contain a bunch of things you don't really want. The problem with bloatware is that for many manufacturers, it's necessary. Their margins are so thin that even an extra couple of dollars on the price tag could cost sales, so they keep the sticker price

as low as possible and try to get some money back from companies who want them to pre-install their software. It's no coincidence that the company with the highest profit margins in the business, Apple, doesn't bother with pre-installed trialware.

So, if you really begrudge spending time removing unwanted applications, perhaps the answer is to buy a more expensive computer.

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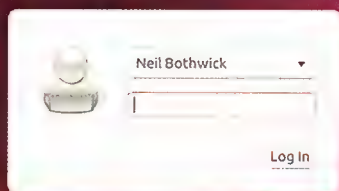
howto

» QUICK TIPS

Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

Being sent back to the login screen may not mean you got your password wrong, especially if you're using auto-login.



LINUX

PASSWORD PUZZLE

I've had repeated problems trying to get Ubuntu to accept my password, which I know is correct. Originally, I had set automatic login but nevertheless was presented with the login screen, where my password wasn't accepted. If I booted into recovery mode the same password worked OK! I then opted to boot as Guest and with sudo accepting my password I reset my user name to the original password, logged out but still can not log in. I created a new user (name1) using the same password and can get access every login. I would like to solve my original login problem out of interest's sake if possible.

Cushie

I doubt that the problem is your password, otherwise you wouldn't be able to log into the recovery console, but auto-login should work. It sounds like something is preventing you from logging into the desktop, which is why you see the login window even though you have auto-login turned on. It tries to log you in, fails and returns to the login screen. You have tried everything reasonable as far as managing your password goes, so I strongly suspect a problem with permission settings in files or directories your desktop needs to write to. I have seen this before, where a critical directory or file

becomes owned by root, usually as a result of trying to fix something else, leaving the user unable to write to it.

Fortunately, this is easy to fix. Boot into recovery again and log in as the affected user, then run this command to reset ownership of all files in your home directory back to you.

```
sudo chown -R ${USER}: ~
```

The chown command is used to change ownership (aka chown) of files. The -R option tells it to recursively change all files below the given path. The environment variable \${USER} is expanded to your user name (this is why you need to be logged in as the affected user for it to work). The colon following the user name instructs chown to also change the group ownership to the default group for that user. Finally, the shell expands ~ to the path to your home directory. You need to run it with sudo as you need root permissions to change ownership of anything that does not belong to you, and those are the files we are

interested in. Incidentally, if you omit the sudo, chown will spit out an error for each file it cannot change, a quick and dirty way of finding the affected files. A more correct way of finding them is with the find command:

```
find ~ ! -user ${USER}
```

This translates to find everything in ~ where the owner is not \${USER}. Chown will not affect file permissions, those are changed with chmod, and changing them recursively throughout your home directory isn't a good idea. Some programs rely on specific permissions for their files, but none of them object to files being owned by the user running the program.

Neil Bothwick

WINDOWS

A TINY BIT TOTALLY ANNOYING

I have a slight, very frustrating, problem. I recently tried installing Windows 8 on my PC using the upgrade version from Windows 7. But every time, it stops during the setup phase and says there was an error and it takes me back to Windows 7. If I do the same but choose to remove all programs before it installs, it works perfectly until I try installing my motherboard drivers. And I have tried installing Windows 8 drivers from the web after installation to no avail.

Daniel Joubert

Are you installing those motherboard drivers because something doesn't work, or just out of a sense of completeness? Drivers aren't Pokémon; you don't need to catch them all. If your motherboard doesn't have Windows 8 compatible drivers available, it may be that they will be available from the manufacturer's web site eventually. But equally, they might very well not be, because Windows 8 may have perfectly functional drivers for your

Gotta catch 'em all!™

Motherboard drivers aren't like Pokémon.

hardware already built in.

If you are insistent that you need these drivers installed, you could try right-clicking the setup file for the drivers and selecting 'Troubleshoot compatibility'. When the wizard starts, select 'Worked in a previous version of Windows' and choose Windows 7. Now let it run and see if that allows them to install correctly.

Louis Villazon

LINUX

BUILDING FROM SOURCE

I am trying to compile programs from source code and so far I have built two. I can't build the next three because it says there's no

./configure file. The programs I'm trying to build are Nightingale, FlightGear and Kompozer. I can get them with Deb packages but wish to build them. I've tried Alien but the Deb files created are faulty.
Narendra

The ./configure && make && sudo make install process is specific to programs using the GNU Autotools system. This is the majority of open source software but by no means all of it. You should always look for build instructions in the source code's root directory. This is usually, but not

always, a file called Readme or Install. Even if the software does use Autotools, you should read the instructions in case any special steps are needed. If there are no instructions, check the project's web site or wiki.

In the case of FlightGear, the archive contains an install file that explains that cmake is used. This is a more modern approach that's gaining in popularity, particularly on cross-platform projects. That file explains just what to do to build it.

It's good that you're trying your hand at compiling software yourself instead of relying on pre-built packages, just take the time to read all instructions first, and Alien will not help you here. It converts between binary package formats, which is useful if you want to install an RPM package on a Debian-based system. You may find Checkinstall useful, which you can install from the terminal with `sudo aptitude install checkinstall`. This program replaces the install phase from a source build with a step that builds a package in your chosen format, which you can then install through your package manager.

APC staff

Even an older CPU like a Core 2 Quad should have no performance problems when running the latest versions of Windows.



WINDOWS

WHICH WINDOWS IS BEST?

I can't seem to make up my mind. Which OS will be the best for my system? I have a 256GB hard drive, Intel Core 2 Quad 2.66GHz CPU, 5GB RAM and a 1GB graphics card. Which do you think will be the best for me — Windows XP Pro or Windows 7 Ultimate. I am not an avid gamer, do not play games often, as I can't afford it. I want something stable with a nice interface but also a lot of speed.

Jean Brummer

You talk as if this is a PC you already have, so which version does it have now? I wouldn't advise anyone to remain with XP any more. Microsoft is ending support for it on 8th April, and it will only become less stable and less secure as time goes on. Windows 7 on the other hand is perfectly functional and there is no point upgrading to Windows 8 on fairly old hardware like yours just for the sake of it. If this is a PC you are buying second hand and it somehow doesn't have an OS, then you might as well get Windows 8.1.

None of them is going to give you markedly more speed than the other though. Windows has always been like that. The newer version generally has better support for newer hardware, worse support for older hardware, some extra user interface features that you might want and some others that you'll turn off or never use, but it runs about the same speed as the previous version. And most of the time, you don't really care. Your PC is low-end by today's standards, but it's not so slow that you'll notice performance problems in ordinary Windows apps. In games you will, but that's not something that your version of Windows will change much. You just need a better graphics card.

Luis Villazon

HARDWARE

MACBOOK SCREEN AS SECOND MONITOR?

I have a late 2013 iMac and was also lucky enough to get a new MacBook Pro as an early Christmas present. I know I can use





That Retina screen is lovely, but you can't use a MacBook as an external monitor.

"Why do you want to use the MacBook as an external monitor? The iMac has the bigger screen and unless your sofa and your desk are right next to each other, a Thunderbolt cable isn't going to let you access your iMac from the sofa."

the iMac as an external monitor for the MacBook using Command-F2, but is there any way to do this in reverse? I want the MacBook Pro screen to act as a monitor for the iMac. I've tried this with Air Display over Wi-Fi, but the display response time is choppy. Is there a way to achieve a similar thing using the Thunderbolt cable?
Thom Croxton

I fear not. MacBook Pros don't have the hardware to support Target Display Mode (which is what you are using to echo the MBP display onto the iMac). Without that capability, any solution must necessarily use network protocols to move the screen data around and these just can't cope with the enormous bandwidth of 30 frames per second from a high-resolution screen. You can create networks using the Thunderbolt connection in Mavericks, but it won't do you any good. Your video frames still need to be wrapped up into network packets, where the bottleneck lies.

So let's take a step back. Why do you want to use the MacBook as an external monitor? The iMac has the bigger screen and unless your sofa and your desk are right next to each other, a Thunderbolt cable isn't going to let you access your iMac from the sofa. If you want to access games or apps on your iMac, it may be cheaper to just buy a copy for the MacBook Pro.

Luis Villazon

LINUX

HOW DO I LINUX?

Sorry about frying your brain with questions, but I just don't understand the Linux installation process. How do I put Linux on my XP and where do I get the Windows remover software and is it free? I am also not sure if my system will support Linux. Is the Windows deinstaller free? If not where can I get it?

Samuel Adkins

So you have a PC with Windows XP on it and you want to remove that and replace it with Linux, right? Well the good news is that the 'uninstaller' for Windows is free and comes bundled with basically any Linux install disc.

Usually though, people don't want to completely erase their hard disk when they install Linux; they want to keep access to both operating systems. The most common configuration is to use a live CD. This is just a DVD disc that has a bootable version of Linux on it. You burn the installation directly to the DVD and nothing gets put on your hard disk, except for some temporary files whenever you actually boot into Linux. You can create a live USB stick that works in much the same way as well, but it's slightly more complicated to set

up. Live CDs are a good way to double-check how well a particular flavour of Linux (or 'distro') will run on your PC, without erasing data on your hard disk or changing the partition table.

If you install Linux on your hard disk, you can either put it in its own partition and dual boot between Windows and Linux or you can tell the installer to use the whole of your hard disk and it will automatically replace Windows for you. There is also a thing called WUBI, which will install Ubuntu Linux on the same partition as Windows using clever technology called loop mounting. Have a look at www.ubuntu.com/download/desktop for more.

Luis Villazon

disc contents

» OUR SELECTION OF EXCLUSIVE FULL-VERSION PROGRAMS

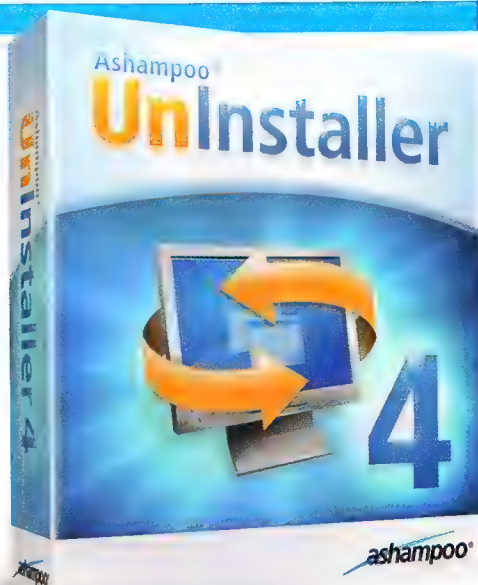
ISSUE 401 APRIL 2014

Clean up your PC

Maintain your computer properly with Ashampoo UnInstaller 4

FULL VERSION WORTH \$29

Windows is famous for getting more sluggish the more you use it. One reason for this is that many programs leave your computer full of digital garbage when you remove them. Ashampoo Uninstaller 4 completely eliminates this problem. It lets you test software with confidence because you can be sure that no trace of programs you remove are left anywhere on your system.



SYSTEM REQUIREMENTS

- A DVD-ROM reader or burner.
- The APC disc is designed for use with up-to-date browsers (for example, Internet Explorer, Chrome, Firefox).
- The interface included on the APC disc requires a JavaScript-enabled browser.
- An internet connection may be required for online registration of software before use.
- The software packages on the APC disc have different system requirements. Software is included on the disc for Windows XP, Vista, 7 and 8.

BEFORE INSTALLING

- Check the disc using a virus scanner complete with the latest antivirus data updates. The disc was checked before burning, but new viruses are being discovered all the time.
- Back up any important system and data files. It is not recommended that the software contained on these discs be installed on production machines.
- If you have any questions regarding the use of the APC disc, click the 'Help' button at the top of the screen.

USING THE DISC

- Insert the disc into a CD/DVD-ROM reader or burner and your web browser should automatically load the interface. If not, launch your web browser and load the default.html file from the root directory of the disc.

HELP

- If you have any problems with the APC disc, please visit www.apcmag.com/disc.htm.
- APC provides no technical support for this disc or any software provided on it.



BROWSE SAFELY AND SECURELY

Protect your privacy and your system with Abelssoft AntiBrowserSpy 2014

FULL VERSION WORTH \$45

AntiBrowserSpy protects you from browser espionage. The program prevents spying by turning off the hidden spy functionalities of your browsers. AntiBrowserSpy deletes internet traces, cleaning signs of your surfing activities: browser cache, history and cookies. Plus AntiBrowserSpy can create backups of all your browser settings.



FRESHEN UP YOUR DESKTOP

Control your desktop wallpaper with 1-abc.net Wallpaper Rotation

FULL VERSION WORTH \$16

1-abc.net Wallpaper Rotation lets you freshen up your desktop wallpaper, enabling you to add as many picture files as you like — the program will change your desktop background image automatically as often as you wish! You can also add complete folders to this list. You can decide if you want to auto-update on startup, after a week or after a specific period. There is also an option to let the program shuffle the order of your images.

PLUS! INSANITY'S BLADE PLAYABLE DEMO & DESKTOP UTILITY ESSENTIALS

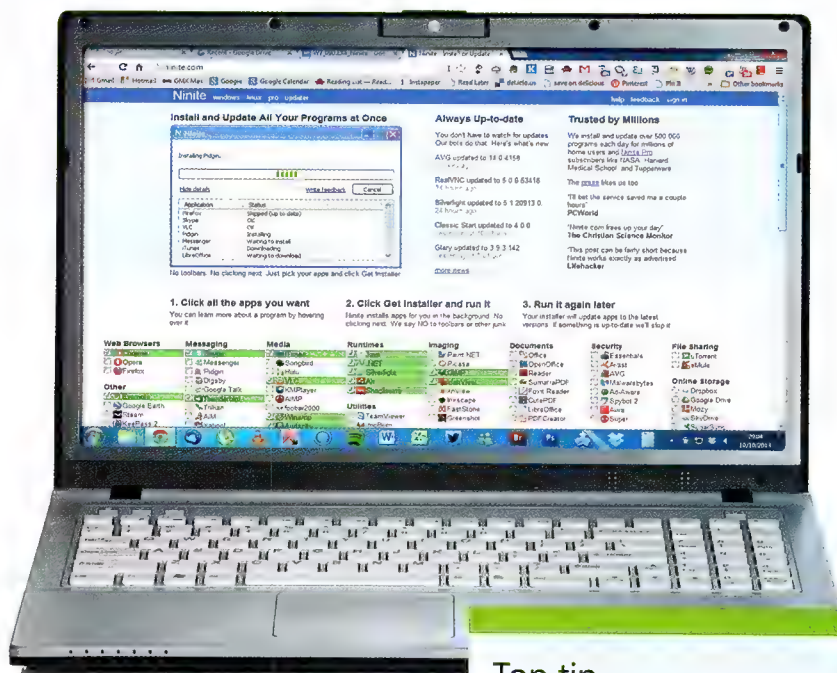
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Get autoupdates for third-party Windows apps

Keeping your PC's software up to date can sometimes feel like a full-time job, but you can automate many updates by using Ninite, saving you time and effort.

Everyone wants their PC's programs to have the latest features, fewer bugs and no security holes, but individually updating what might be dozens of programs can be a real pain. When it comes to Windows' own updates, you can leave your computer to look after itself, but your third-party programs are still waiting for you to update them. That's where Ninite (ninite.com) comes in, doing all the tedious updating for you.

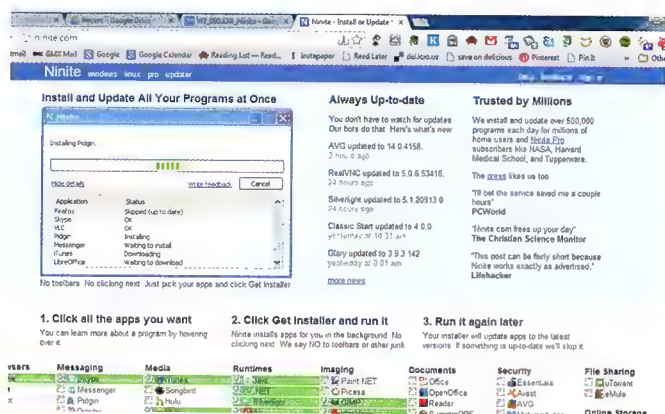
Ninite is particularly useful for new machines – when you set it up, you pick various programs to install and Ninite will take care of everything for you. Ninite will even exclude the installation of toolbars with the software you've opted to install. The default selection of apps that Ninite is capable of installing is extensive and it's a great addition to any Windows PC.



Top tip

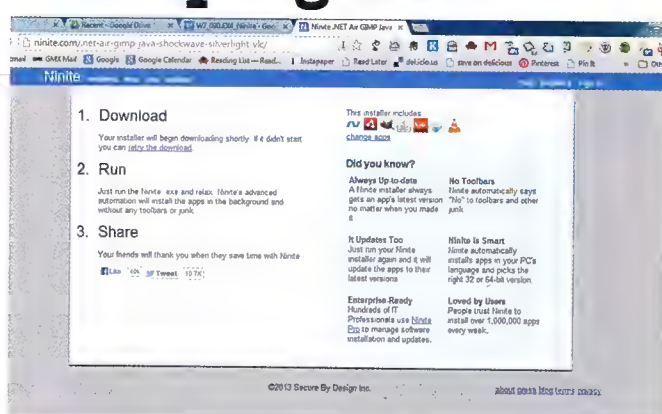
As useful as Ninite is, it doesn't prioritise installations, so make sure you choose to install any security software first.

Take control of out-of-date programs



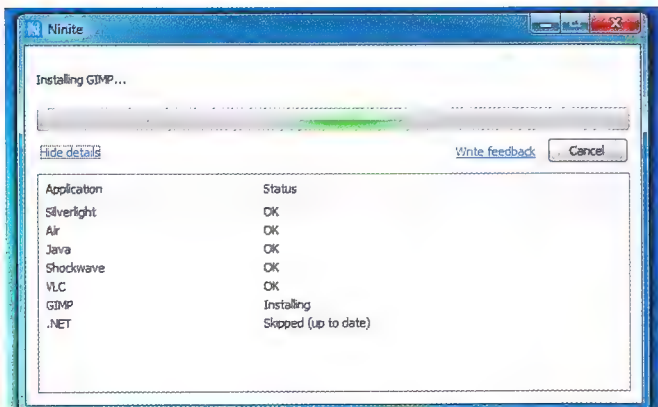
1 GET THE PROGRAMS YOU WANT

Oddly, you start using Ninite before you even download it. Just go to ninite.com and start ticking the checkboxes for the free applications you want to install on your computer. The catalogue is extensive and is already arranged into categories. It includes favourites such as Firefox, Google Chrome, VLC, iTunes, Skype, Dropbox and Google Drive.



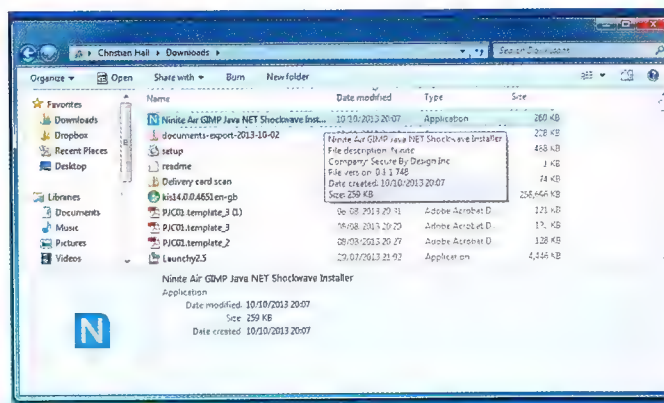
2 GET YOUR PERSONALISED INSTALLER

Once you've finished selecting the programs you want on your machine, click 'Get installer' (the big green button at the bottom of the page). Then simply locate the installer (you'll usually find it in your Downloads folder) and double-click it to install the programs. It's a tailored package, so this will take a little longer if you've selected a lot of programs.



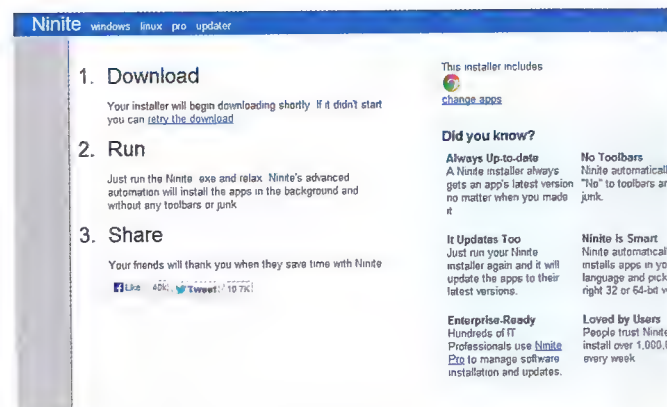
3 REINSTALL IF REQUIRED

Thankfully, Ninite doesn't force you to click Next five times, agree to usage terms or any of the usual tasks associated with installing programs. The only issue you may come across is that one or two programs you've selected may fail to install. If this happens, click the 'Retry/Reinstall' link, and after a few minutes, those other programs should be installed, too.



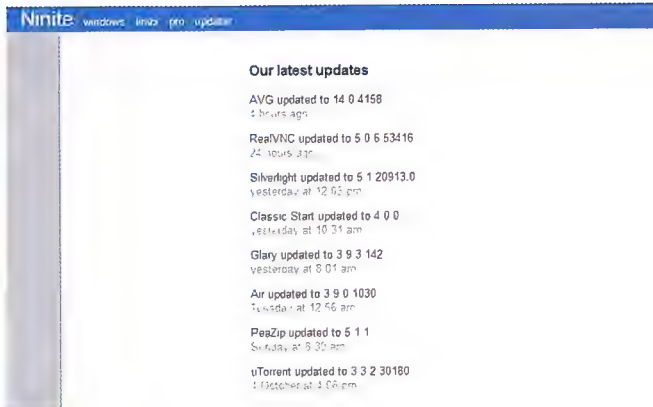
5 KEEP THE OLD INSTALLER

Ninite installers always install the latest versions of apps, regardless of when you downloaded them. This means that after you install some apps, you can keep that exe file somewhere accessible and run it when you want to update them. You can keep multiple installers for this purpose, but be careful not to overwrite the old file if you download a new one.



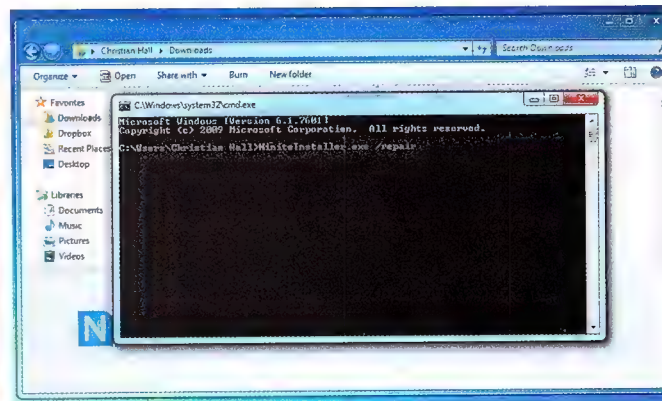
7 SEND INSTALLERS TO FRIENDS

On the installer download page (the one that appears after you click 'Get installer') you'll find a permanent URL that you can copy and send around to share a Ninite installer package. This is also useful to send to yourself via email if you want to install the same set of programs on another machine — from a desktop to a laptop that you use on the move, for example.



4 INSTALL MORE

Ninite isn't a one-time-only package, which means you can go back to the web site and select a bunch of new programs to install any time. Ninite's bots constantly scour the web for the latest software builds — if you click the 'More news' link under the 'Always up to date' heading on the homepage, you'll be presented with a list of all the latest version numbers.



6 COMMAND LINE INSTRUCTIONS

Ninite doesn't exist as a program in its own right, so you might think it's impossible to access, but you can execute some instructions using the command line. Open the Start menu, type cmd, then type `NiniteInstaller.exe /repair`, for example, which will force a reinstallation of your apps. See ninite.com/help/features/switches.html for a full list of commands.



8 ENJOY AUTOUPDATED APPS!

That's it! You now have everything at your disposal to make updating dozens of programs far less of a chore. If you end up using Ninite installers regularly, consider Ninite Pro (\$20 a month), which installs programs faster and has some useful business features, such as the ability to manage a whole network of PCs at once and end those irritating Taskbar update notifications. ■

Set up a Linux torrent server with Deluge

Mayank Sharma shows you how to turn an old computer, or even a Raspberry Pi, into an always-on torrent box using Deluge.

If you're like me, you're always on the lookout for projects to recycle old unused computers. One of the best uses for such a machine that lacks the resources to power a modern desktop is that of an always-on headless torrent box.

With a torrent box you can add, manage and share torrents from any other system on the network. You can tuck away the headless torrent box in the corner and let it nibble away at your downloads. Also when it comes to downloading torrents, having an always-on machine helps you maintain a healthy ratio on your tracker.

To begin with you will need to equip the torrent box with a monitor and a keyboard. But once it's all setup you can unplug the monitor and the input devices. As long as it's hooked on to the local network, either via Ethernet or better still wirelessly, you can feed more torrents and access the

downloaded data remotely.

First, you'll need to wipe the hard disk on the torrent box and install a fresh copy of your chosen server operating system, which, in our case, is Ubuntu Server. This distribution has modest system requirements since it doesn't install a graphical desktop.

One thing you need to make sure is that the computer you use has plenty of storage space to accommodate all the downloaded data. For maximum compatibility with other systems and devices around the network, it's best to format the storage areas with the NTFS file system. If you plan to share the same disk with the operating system as well, it's best to keep the OS files on a separate partition.

There are numerous torrent clients available for Linux. We'll be using the Deluge BitTorrent client for this little project, which can run as a daemon on our headless server and accept

connections from other Deluge clients. The Deluge client is cross platform, so you can connect to the torrent box from Linux, Windows and Mac OS X.

Deluge offers multiple ways of accessing it remotely. You can access basic functions via a browser-based user interface. Setting this up doesn't require much work, but exposes only some of Deluge's features. To exploit it to the hilt you'll need to setup the Deluge daemon to accept connections from other desktop Deluge installations.

SETTING UP DELUGE

Let's begin by first setting up Deluge's WebUI which doesn't take much effort. Pull the required packages with:

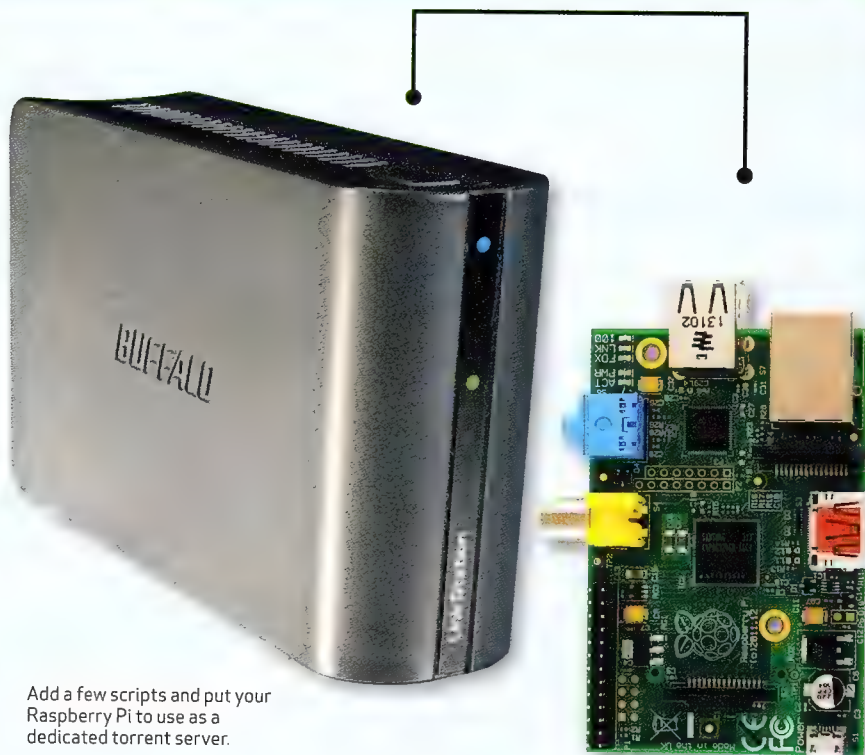
```
sudo apt-get install deluged
python-mako deluge-web
```

The command automatically starts the Deluge daemon, but you'll have to

Power a torrent server with a Raspberry Pi

You can use a Raspberry Pi to power the torrent box. The commands to install the Deluge daemon and the WebUI aren't any different from the tutorial. Of course, a Raspberry Pi doesn't have a hard disk, so you'll have to use an external USB drive and a Samba server (Google it for info).

However, the Raspberry Pi does require one additional step. You'll need to do some CLI magic to make sure the Deluge daemon and the WebUI start automatically when the Pi boots up. To do this, copy-paste the two configuration scripts that the Deluge developers have provided for Ubuntu (tinyurl.com/6pg3o3n). Make each of them executable and add them to the start up with `sudo chmod 755 /etc/default/deluge-daemon` and `sudo update-rc.d deluge-daemon defaults`. Lastly, update the init file to include them: `sudo chmod 755 /etc/init.d/deluge-daemon` and `sudo update-rc.d deluge-daemon defaults`.



Add a few scripts and put your Raspberry Pi to use as a dedicated torrent server.

start the web interface by entering `deluge-web &` in the terminal.

By default the Deluge web-client runs on port 8112. Fire up a browser and point it to the IP address of the server, such as 192.168.3.101:8112. The Deluge web interface will prompt you for a password. The default password is deluge. As soon as you enter the web interface, Deluge will prompt you to change the password.

Before you can start using the web client you'll have to connect to the Deluge daemons. The web interface will automatically launch the Connection Manager window, which lists all of the running Deluge daemon. Simply select the daemon and click on the Connect button. You'll now be able to use the web client to add and control all your torrents running on the torrent box.

If you wish to change the port on which the web client runs, you'll need to edit its configuration file. Head to Deluge's configuration directory with `cd ~/.config/deluge/` and open the configuration file called `web.conf` in your favourite text editor. Scroll down the file and find the line that reads "port: 8112" and replace 8112 with any port number above 1000.

DAEMON'S WORK

As mentioned earlier, to get the maximum out of Deluge you will need to configure the Deluge daemon to

accept connections from a remote client. Start by pulling up the Deluge console client to make configuration changes to the Deluge daemon, with the command:

```
sudo apt-get install deluge-console
```

To make changes to the daemon, first stop the daemon with:

```
sudo pkill deluged
```

and open its configuration file `~/config/deluge/auth` in your favourite text editor.

Scroll down to the bottom of the file and enter three parameters to specify the username and password you wish to use, along with the authentication level for the daemon, separated by a colon, such as `my-username:my-password:10`. Remember to replace the my-username and my-password parameters. The 10 authentication level gives the daemon administrative privileges on your machine.

Save the file and exit the text editor. Back at the console, start the Deluge daemon with the `deluged` command. Then head into the Deluge console by entering `deluge-console` in the terminal. This will launch the command-line interface for the Deluge daemon.

We'll use the console to make the Deluge daemon accept remote connections. In the console type:

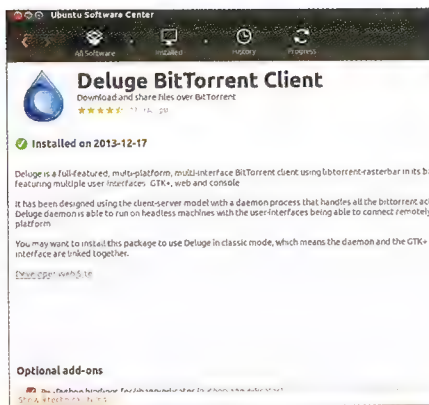
```
config -s allow_remote True
```

The client will confirm that it has successfully changed the configuration value. You can now exit the console client by typing `exit` and then bring the changes into effect by first stopping the Deluge daemon with `sudo pkill deluged` and then starting it again with `deluged`.

That's all there's to it. Deluge is now all set up to accept connection from remote clients on the network. Follow the walkthrough to setup clients to connect to your box.

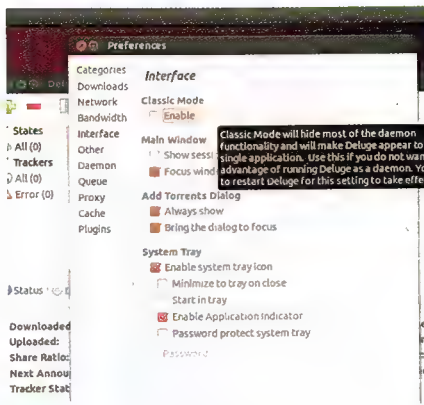
"With a torrent box you can add, manage and share torrents from any other system on the network."

Connect to the server



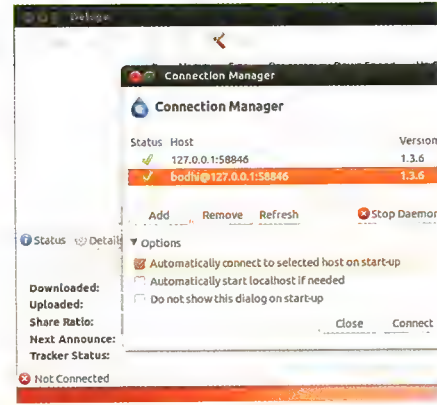
1 INSTALL CLIENTS

Now that the Deluge daemon is ready to accept connections, you'll need to install the Deluge desktop client on other computers on your network. Most desktop distributions include Deluge in their repositories so you can download it from the distro's package manager. Being cross-platform, you'll also be able to head to Deluge's download page to get Windows and Mac OS X clients, if needed.



2 ENABLE CLASSIC MODE

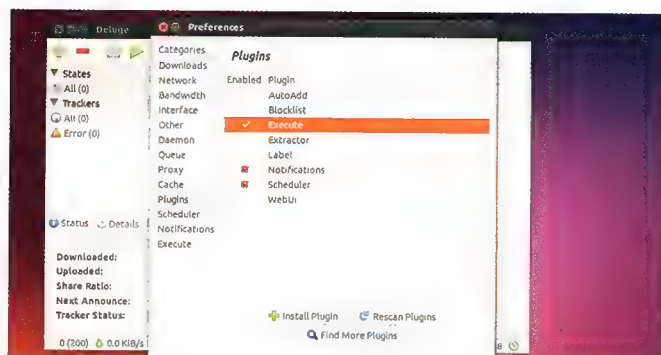
By default, the Deluge clients are set up to download to the local computer. We want to change this behaviour, so you'll need to fire up the Deluge client and head to 'Edit > Preferences' and switch to the Interfaces category. Here you'll notice a checkbox for Classic Mode which is enabled by default. Uncheck this box, click OK and then restart the Deluge desktop client.



3 ADD HOST

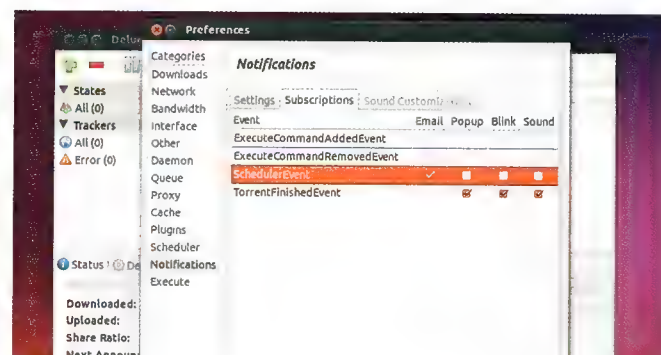
When you restart Deluge it will automatically fire up the Connection Manager. Click on the Add button in the Connection Manager and enter the connection details about the daemon. Click the Add button which takes you back to the Connection Manager. Select the added entry and click the Connect button to connect the client with the daemon running on the torrent box.

Enhance your torrent experience



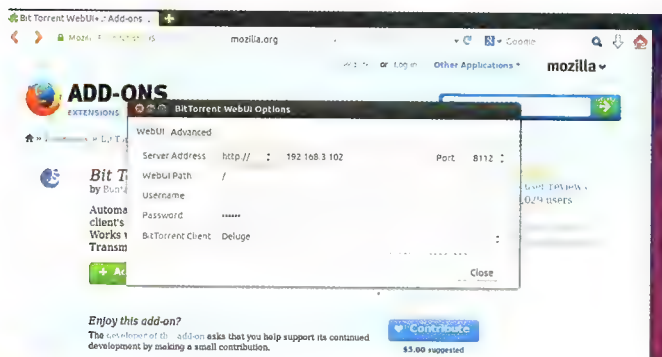
1 ENABLE DELUGE PLUGINS

Deluge includes a host of useful plugins. To enable them head to 'Edit > Preferences' and switch to the Plugins category. Click on the checkbox next to a plugin to enable it. Enabled plugins appear as separate categories in the Preferences window. The client ships with eight plugins and you can click the Find More Plugins button to fetch and install additional third-party plugins.



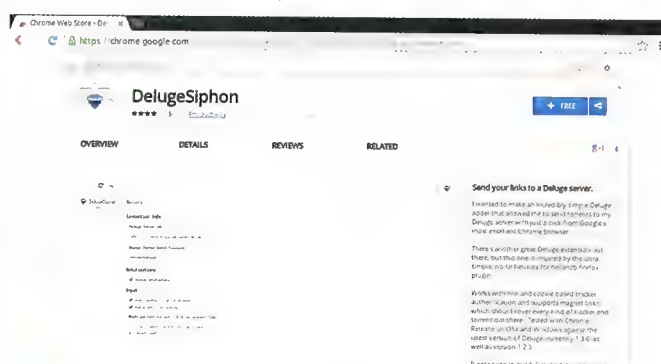
2 USEFUL PLUGINS

One useful plugin is the Scheduler, which lets you limit bandwidth usage based on the time of day. The Notification plugin displays pop-ups on the desktop or sends you email alerts when a torrent finishes downloading. Advanced users will also like the Execute plugin, which runs a specified command when a new torrent is added or a torrent completes downloading.



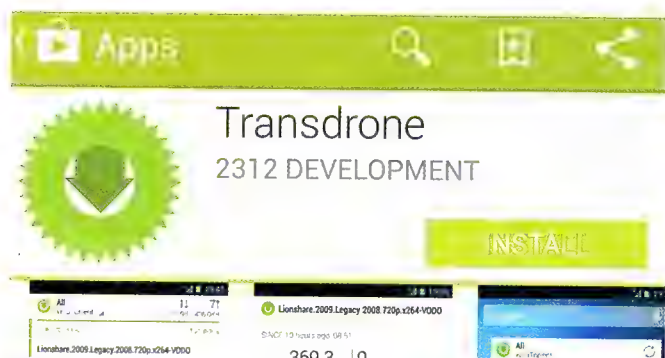
3 ADD-ON FOR FIREFOX

If you use the Firefox web browser you can add the Bit Torrent WebUI+ Firefox extension that will let you add torrents to the Deluge daemon via the web interface. After you've installed the extension, it'll open a dialog box for you to enter the connection details of the Deluge WebUI, and when you click on a torrent link in future, the torrent will be automatically added to the remote torrent box.



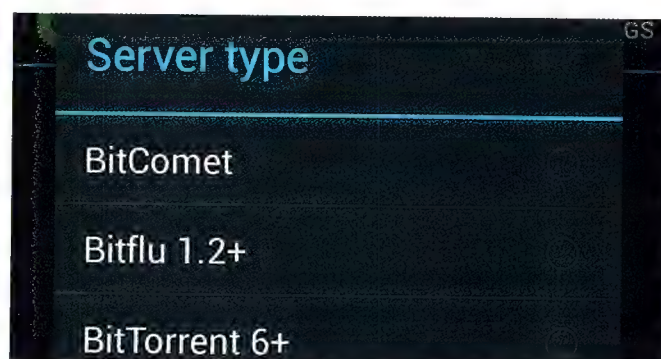
4 ADD-ON FOR GOOGLE CHROME

If you use the Chrome browser, you can install the DelugeSiphon app from the Google Play Store. When installed, you'll need to click on its icon in the address bar and head to the Options page. Enter the IP address of the daemon along with the port number and the password of the WebUI. This will enable you to right-click on any torrent file and select the Send to Deluge option to add the torrent.



5 USE A MOBILE CLIENT

You can also install an app on your Android device to add and control downloads. The Google Play Store lists several apps that can connect to the Deluge daemon. Two of the most popular apps are Transdrone and the feature-rich TransDroid app. While the former is available in the Play Store, to download the latter you will need to visit the official site via your smartphone (transdroid.org/latest).



6 SETUP THE CLIENT

The procedure for setting up both Transdrone and TransDroid is the same. When you launch the app for the first time, you'll get a welcome notice. Tap on the Settings button and then on the Add a new server button. Now select the Server type option and select Deluge 1.2+ from the list. Then enter the IP address of the torrent box to connect to the web user interface of Deluge.

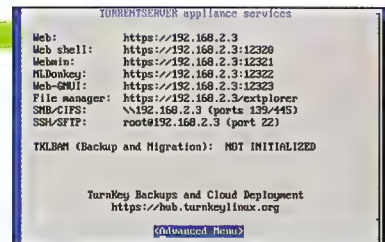
Use a TurnKey Linux Torrent Server

The TurnKey Linux project produces Linux-based, self-contained, task-oriented servers that run on top of Just Enough Operating System (JeOS) components, which, as the name suggests, are required to power just that particular app. The project's Torrent Server appliance has all the tools you need to host your own file server. It's also got a multi-protocol file sharing app, called MLDonkey, using which you can download all types of files.

The best thing about the appliance is that after installation you can manage it remotely from within a browser. You

can upload and download files, compress and uncompress them using popular compression algorithms, such as ZIP and RAR, install additional packages, and do a lot more, from any web browser on any operating system within your network or from anywhere on the internet.

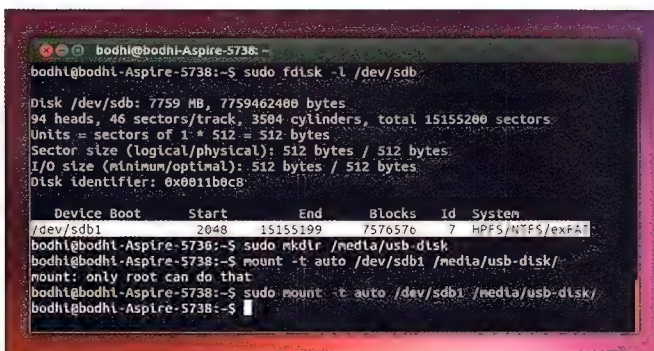
You can download the appliance from www.turnkeylinux.org/torrentserver. You can either directly install the Torrent Server appliance, or try its components by first running it in live mode. Whether you install or run it live, you'll be prompted for a password to the root user as well as to the admin user for the various components in the appliance: the MLDonkey file sharing app, the P2P-GUI to MLDonkey, and the eXtplorer file manager.



Unlike our torrent box which uses Deluge, the TurnKey Torrent Server uses the versatile MLDonkey file sharing app.

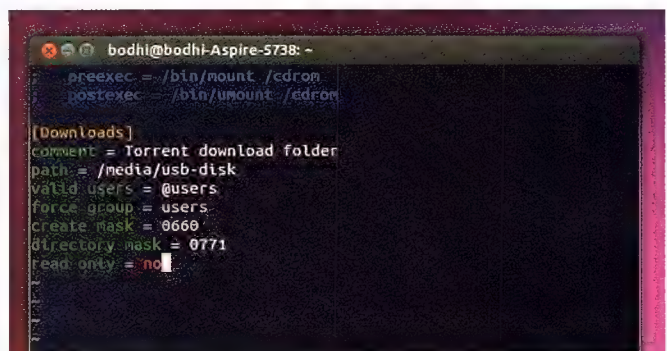
That's all there's to it. Once you've configured the users, the torrent server appliance will copy all the files and install the boot loader as well. After restarting, it will boot to the configuration console which lists all the addresses for accessing the various apps in the server.

Keep downloads on an external drive



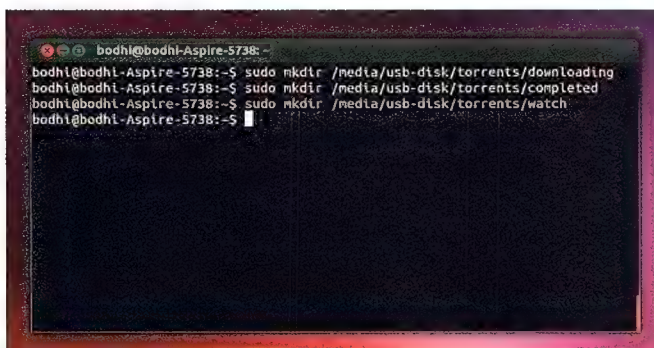
1 MOUNT EXTERNAL DRIVE

Format the external drive as NTFS. Then make sure the distro can read NTFS drives by installing the packages with `sudo apt-get install ntfs-3g` and create a mount point for the disk with `sudo mkdir /media/usb-disk`. Now plug in the USB device and find its device address with `sudo fdisk -l`. Assuming there's one partition called sdb1, mount it with `sudo mount -t auto /dev/sdb1 /media/usb-disk`.



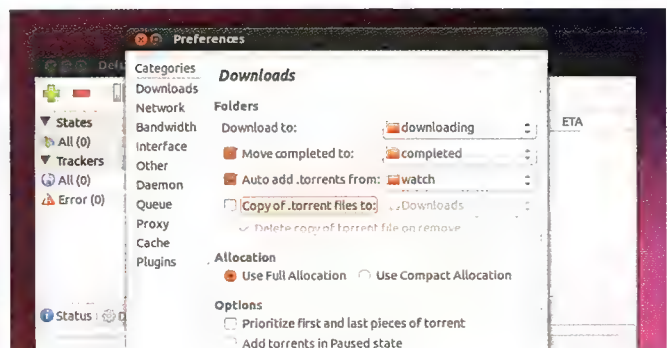
2 SETUP REMOTE ACCESS

Install Samba with `sudo apt-get install samba` and `samba-common-bin` to access the USB drive from remote systems. Then edit `/etc/samba/smb.conf` and uncomment the `security=user` line. Create a new section of the file (as above), and add a user called downloads to access the shares with `sudo useradd downloads -m -G users` and add them as a Samba user with `sudo smbpasswd -a downloads`.



3 CREATE DIRECTORIES

Next create new folders for Deluge to store downloads in. Use `sudo mkdir /media/usb-disk/torrents/downloading` and `sudo mkdir /media/usb-disk/torrents/completed` to create directories that will store incomplete and completed downloads. Create another directory with `sudo mkdir /media/usb-disk/torrents/watch`. We'll configure Deluge to scan this directory and add new files.



4 PLUG THEM INTO DELUGE

Once the directories have been created, you'll have to plug them into the Deluge desktop clients. Fire up Deluge and head to 'Edit > Preferences'. In the Preferences window, select the Downloads category, which lets you specify the different folders for storing downloads. Toggle the radio boxes next to the first two options and use the file manager to point to the folders you've created on the external drive attached to the box.

Faster, more flexible PDF creation

OS X's PDF creation tools are among its best and most-overlooked features. They're much-improved in Mavericks, but Matthew JC. Powell has some ideas for making them even better.

Ever since the introduction of Mac OS X back in 2001, it has had the ability, right out of the box, to create a PDF from any application that could print. All you do is go to the 'File > Print' (or press Command-P) then click on the PDF button in the lower-left corner of the Print dialog, then from the drop-down menu, select 'Save as PDF'. So simple, and yet so very annoying.

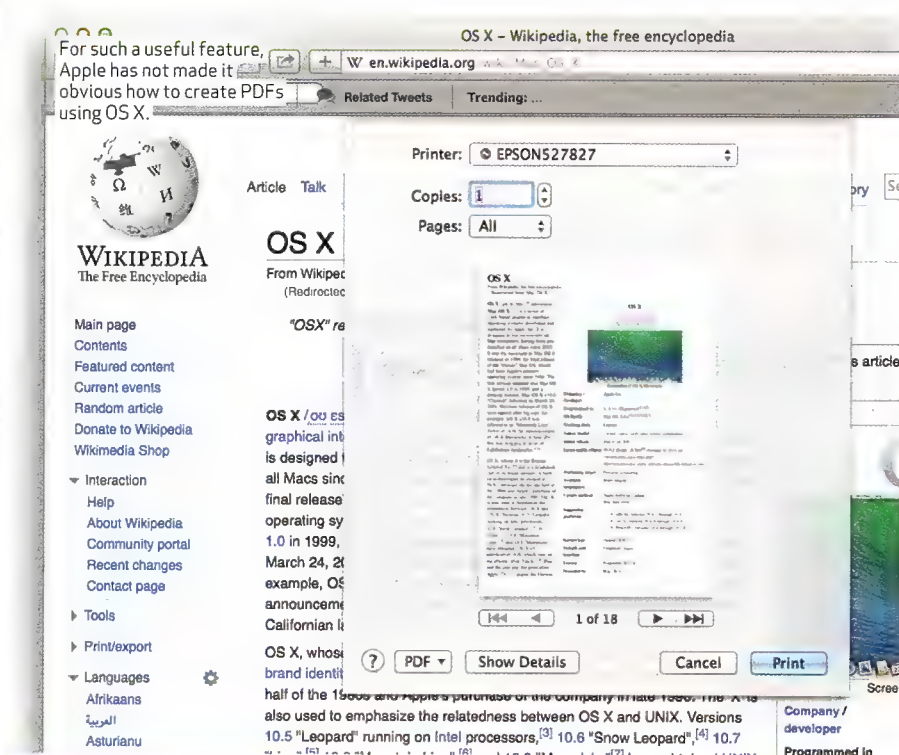
Why is such an extremely useful feature hidden under the Print menu (instead of, say, oh, I don't know, Save) and then several layers of extra clicking? You'll have to take that up with Apple. Possibly it has to do with the inheritance of the licence for PDF from NeXT? Whatever the reason, there are many users of OS X who have no idea they can create a PDF so easily.

In Mavericks, Apple has now supercharged the PDF-creation process by integrating some pre-built Automator workflows, so many of the things users often want to do with PDFs after they've created them are accessible from a menu item. This can be a massive time-saver.

For example, one of the things most people need to do in this era of e-commerce is save copies of receipts. If you do this by taking a screenshot from Safari, you should be ashamed of yourself. The better thing to do is to "Print" a PDF of the receipt. In Mavericks, you can even go to the PDF drop-down menu in the Print dialog (yeah, it's still buried) and select 'Save PDF to Web Receipts Folder'. If you don't already have a folder by that name, OS X will create one, and your PDF will be waiting for you inside it – could not be easier. Or, could it?

What if you could send that PDF of your receipt to that Web Receipts folder at the push of a button, without all the clicking and digging through menus? Obviously there is no keyboard shortcut in place, but you can create your own.

First, open the Keyboard pane of System Preferences, then click on the Shortcuts tab. In the list on the left-hand side, select App Shortcuts, and under the box on the right-hand side,



"Apple has supercharged the PDF-creation process by integrating some pre-built Automator workflows."

click on the + (plus sign) button to create a new shortcut.

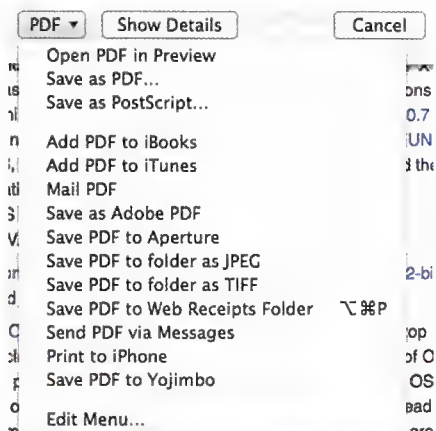
Since this shortcut will apply to any application, make sure that the drop-down menu in the next dialog reads 'All Applications'. For this particular example you could make the shortcut apply only to Safari or your chosen web browser (since that's where you'll be seeing your web receipts anyway) but for simplicity let's keep it universal.

Next, type the menu item you want the shortcut to activate in the Menu Title field. It's vital that what you type here matches the menu item exactly, including capitalisation and spacing, or it won't work. Be wary that some menu

items, particularly in third-party applications, may have spaces at the end. Also, it's not always easy to tell whether three dots are three separate full-stops or an ellipsis, which you get by typing Option-; . Trial-and-error may be necessary.

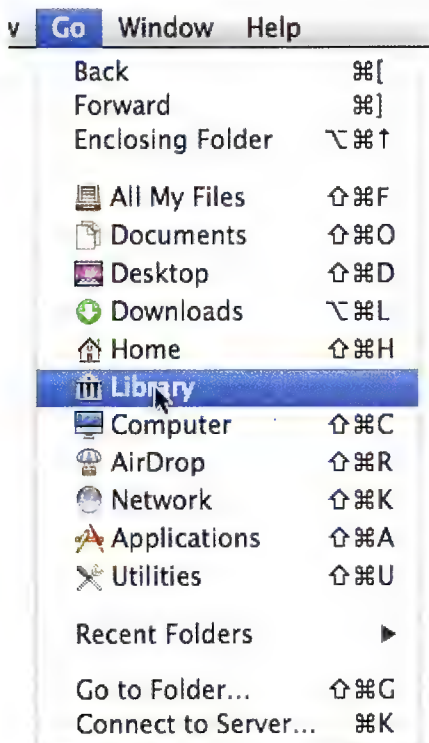
In this case, however, it's a simple matter of typing 'Save PDF to Web Receipts Folder' with no tricky spaces or punctuation – just be careful not to capitalise the t.

Then, click in the box next to Keyboard Shortcut and press the key combination you want to use. As there are a great many of them already in use, it can be tricky to find one that won't make your Mac do something



server models of Mac Pro and Mac Mini along with OS X

Mavericks leverages technologies like AppleScript to make its PDF creation tools far more flexible — but still obscure.

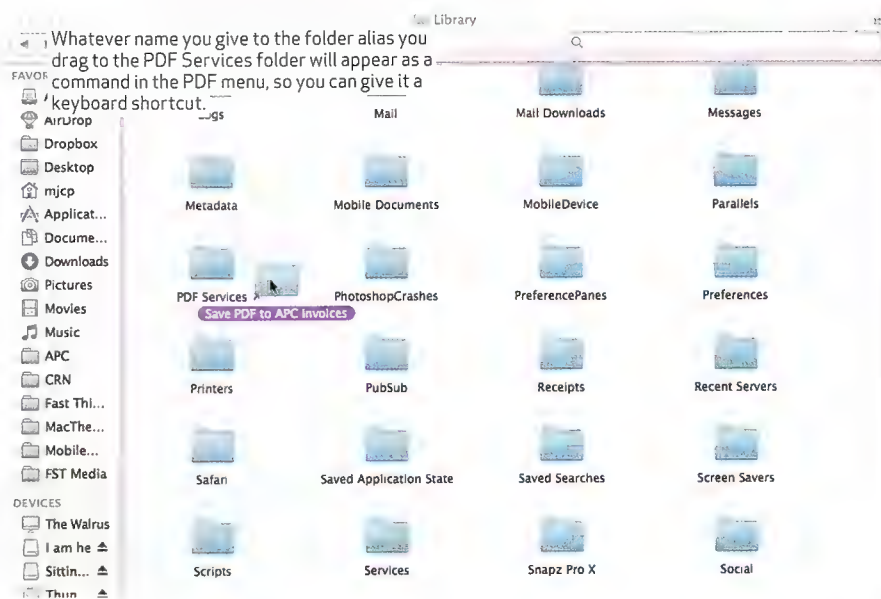
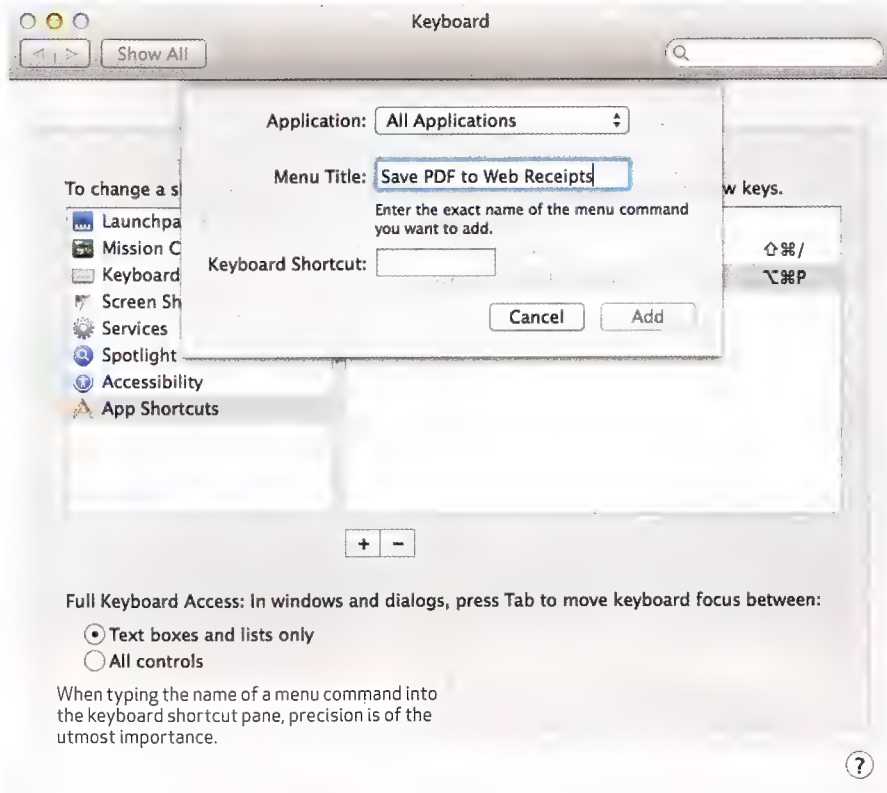


It's not quite like moving a book to open the door behind the fireplace, but pushing the Option key does reveal the Library Apple doesn't want you to see.

unexpected. I use Command-Option-P for this and it works fine.

Then close System Preferences and try out your new keyboard shortcut. Next time you have a receipt you want to save from Safari, press Command-P (you still need to bring up the Print dialog) then Command-Option-P, and your receipt will be saved.

So that's great for the Web Receipts folder, for which Apple has provided a pre-built script. But what if you want to save PDFs to different folders — which, of course, you do? Well, you can do that by selecting the 'Edit Menu' option at the bottom of the PDF pull-down menu — but that has limitations. For instance, you can navigate to a folder you want to



save PDFs to, but then what appears in the menu is just the name of the folder, not a command like 'Save PDF to ...' which would be more intuitive.

Instead, click on the Finder's Go menu, then press the Option key. You'll notice that an item — Library — appears when you push the button. Apple doesn't want you fiddling with the Library, so it's hidden. We do want to fiddle with it, so press that Option button and then click on Library.

In the Library, find a folder called PDF Services. You don't need to open it, just know where it is.

Now, find the folder you want to use as a regular destination for PDFs. For example, you might have a folder

to which you regularly save invoices. Find that folder, and right-click on it. From the contextual menu, select 'Make Alias'.

Next, rename the alias to whatever you want the command to look like to save PDFs to that folder. For example, you might change 'Invoices alias' to 'Save PDF to Invoices'. Don't worry, OS X doesn't need the alias to have the same name as the original. Once you've renamed the alias, drag it into the PDF Services folder. Then, if you want to, you can give it a keyboard shortcut and you're away.

There's more you can do with PDF Services using Automator, but we'll cover that another time. ■



Create killer presentations on iPhone

The easiest way to polish and deliver your presentations on the move.

Keynote is perhaps the most useful of all the iWork apps in its iPhone version. The ability to carry a presentation around on your phone and optionally connect it to a projector or TV using one of Apple's cables will make life much easier for many people, especially when lugging around a larger device isn't really feasible. And since the iPhone 5 brought AirPlay support, with the option of AirPlay Mirroring, you can share exactly what's on your iPhone with your HDTV connected to an Apple TV. For rehearsing or delivering your presentations, this a great addition.

Like Pages and Numbers, Keynote is template-driven; and also like those two apps, its templates are of the highest quality. Charts, tables, shapes and images can all be added to your slides at the tap of a couple of buttons. You can also now import charts and tables from Numbers and edit them directly in your slides. Headlines, bullet points and body text can be formatted according to predefined styles or by specifying the typeface, weight and size you prefer.

THE MAGIC OF MAGIC MOVE

Editing the content of a slide is one thing, but slick presentations need stylish animation, and Keynote provides it. In the iPhone version,

tap a slide in the sidebar, tap the arrow icon and you'll see Transitions, which give you animations between slides. Under the spanner icon (Tools) you'll find the output options familiar from Pages and Numbers. (On the iPad version, this is in the same position as in the Mac version.) You can set the transition for each slide and specify the amount of time it takes.

The Magic Move button enables you

you set for that object on the next slide. The effect is stunning but can be achieved with just a few simple taps. It's one of the features you'll find get used in almost every Keynote presentation you produce.

Possibly the most useful option of all when you're actually delivering a presentation is Presenter Notes. You can make your own notes for each slide and have them displayed on your

"Magic Move is far and away one of the most entertaining options available to you purely because of the versatility it offers."

to animate the movement of objects within a slide, and you can build in elements, enabling you to specify an arrival and departure transition for each part of the slide. You can set builds and transitions, and set Magic Move to be triggered by a tap or occur after a set delay of your choice. Magic Move is far and away one of the most entertaining options available to you purely because of the versatility it offers, but also thanks to how quickly it can liven up a Keynote presentation. At its simplest, it creates an animated transition from the start position of an object on one slide to the end position

iPhone, like a digital cue card, while the presentation itself is shown on a connected TV or projector.

Also useful is Keynote's ability to import PowerPoint presentations. You can even make those vital last-minute edits on your mobile device before heading in to deliver the presentation. With AirPlay, of course, you can use an Apple TV for presenting on a big screen too.

How to get the most from Keynote

Learn the feature to make your presentations shine.

1 ADD TRANSITIONS BETWEEN SLIDES

By default, the slides that you add to your Keynote presentation don't have any transition styles applied to them. That is to say, when you actually play the presentation and advance from one slide to the next, it will simply cut from one to the other with nothing in between.

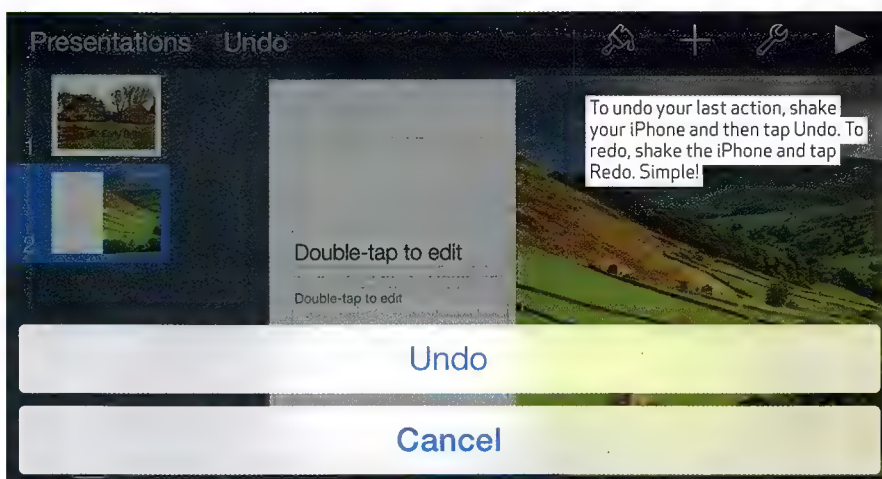
Keynote, however, offers a range of transition styles. To apply one, tap the slide you want to transition from and then tap Transitions on the menu that pops up beside it. Tap the blue right-pointing arrow in the pop-up that says None, and then pick one of the transition styles. If you want to know what they look like, tap one of the styles' names and you'll get a live preview.

2 MAGIC MOVE

Speaking of transitions... Keynote has an amazing trick up its sleeve to make PowerPoint users green with envy: Magic Move. Create a slide with your text and images on it, and then tap it. On the pop-up menu that appears, tap Transitions (you can see this by tapping on the right-facing arrow) and then select Magic Move. This will duplicate your slide. Now, on the duplicate, move objects around, scale them, change them and even apply Builds to them. When you play the presentation, Keynote will automatically generate dazzlingly smooth transitions between the corresponding objects on the two consecutive slides.

3 USING BUILDS

As well as transitions between slides, you can use Builds to affect how objects on your slides – text, images, charts and more – appear on the canvas and disappear from it. You don't have to apply Builds to objects, though. While every object you add to a slide can have both a Build In action (how it arrives onto the screen) and a Build Out action, don't feel you have to apply both or either. Applying only a Build In, for example,



could bring on a sequence of bullet points. You don't have to Build Out the block of text, though – you might be happy for the entire slide to change when you advance.

To apply a Build to an object, tap the object and, in the pop-up menu, tap Animations. You'll then see the options to Build In or Build Out. Tap the option you want and choose the effect you want for your text or object. Keynote will show you a brief preview of how it will work and then return to the Effects screen so you can either select another or make further adjustments.

You can set options for what kind of Build is applied, variables specific to that style, and duration. You'll notice you can have Builds happening alongside others, triggered automatically after a delay or requiring manual advance; explore the options in the tabs in the Build menu.

4 ORGANISING SLIDES

You can "nest" slides inside others simply by grabbing a slide (or a group of slides – tap and hold on one thumbnail, then tap the others you want to select) and then dragging them a little to the right under another slide. Now, tap the arrow at

the left of the "parent" slide to collapse or expand the group. You can have subfolders for slides too.

To reorder slides, simply tap and hold on the slide or group that you want to move, and drag it to the new position. Want to keep a slide but not present it? Just tap it, tap the arrow, and then select Skip.

PRESENTING YOUR SLIDES

When you're ready to present your slides, tap the Play icon in the toolbar. The presentation will move to full screen and you can navigate through it using a single tap, or a page-turn-like right-to-left swipe to advance to the next slide, or a left-to-right swipe to move back one. A double-tap or a screen pinch with two fingers ends the slideshow.

As mentioned opposite, you can even present your hard work on a big screen directly from your iPhone either by streaming wirelessly using airplay and an Apple tv or by using Apple's VGA adapter. This system has another lovely little touch: when you're plugged into a projector, tap and hold on the iPhone's screen and a laser pointer appears on the external display, enabling you to direct your audience's attention to particular areas.

DESIGN OPTIONS

Keynote offers plenty of design choices for the image-heavy presentation. Just tap on your object and then on the Paintbrush icon to access an impressive range of border styles and effects. From here you can also manage masks and positioning. Tap the spanner icon for more control over presentation features such as the ability to apply transitions.

< Back

Duplicate Slide?

Magic Move moves an object from this slide to its location on the following slide.



Magic Move creates a smooth transition between the start position of an object on a slide and the end position to which you move the same object on the next slide. It's under Transitions and Builds in the Tools menu (spanner).

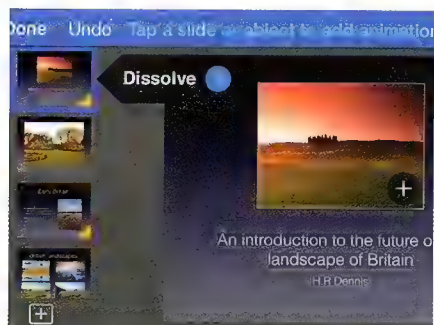
Do you want to duplicate your slide?

No

Yes

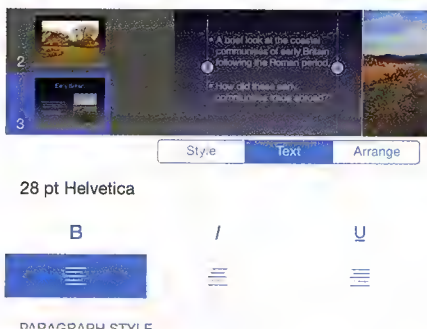
Get even more from Keynote

Continue to refine your slides.



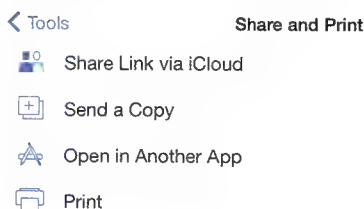
1 SWITCHING STYLES

To add a little flair to your transitions, you can use a special Build In or Build Out feature. You'll need more than one slide to do this. Tap on the slide you want to transition from, tap on Transition, and then select a style. Now your slide will exhibit that effect when changing.



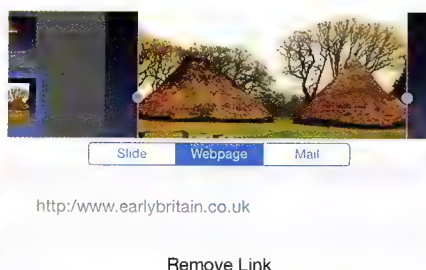
4 HANDLING FONTS

You may have chosen a cool layout but want a different font. To change it, select the text you want, then tap the Paintbrush icon. Under Style you'll see the font name with an arrow — tap the arrow and then tap Font. You can now choose a new typeface.



7 SHARING OPTIONS

In Keynote tap the spanner icon, then 'Share and Print > Send a Copy'. You'll now see a few sharing options, starting with AirDrop to nearby iOS devices. The other options for sharing your Keynote presentation are Mail, Message, iTunes or WebDAV.



2 ADD LINKS

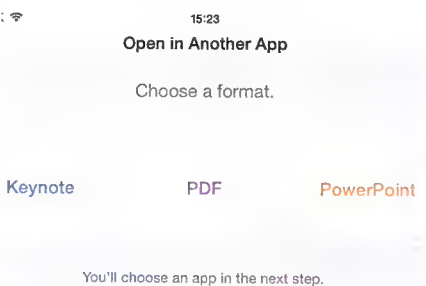
Tap on the Tools (spanner) icon, choose 'Presentation Tools > Interactive Links' and then tap an object or selection of text on the page. You can now link to a specific slide, a URL or an email address by using the tabs at the bottom of the pop-up box. When you're done, tap OK.



This is where I need to bring out my model of a Viking longboat to show where they travelled to raid settlements.

5 ADD PRESENTER NOTES

You can view Presenter Notes on another display so only you see them. Tap the spanner icon, choose Presenter Notes and enter your text. Do this for each slide. To view your notes you need to be in Presenter Display mode, activated if connected to an external display.



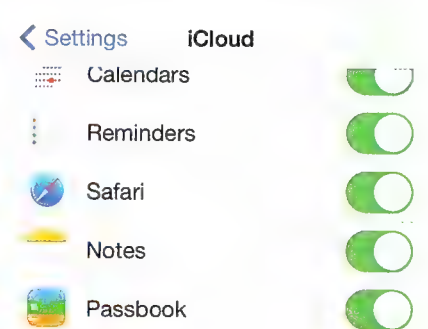
8 CHOOSE A FORMAT

If you choose 'Open in Another App' you see on the first screen that you have to select a format first — either a native Keynote doc or PowerPoint or PDF. Choose one, then on the next screen you get to choose an app. Compatible apps will show up as a list.



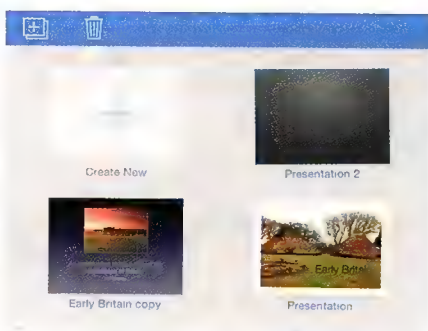
3 WORKING WITH MASKS

To crop an image or to display a certain area, you need masks. Tap the image you want to edit, then tap the Paintbrush icon and choose 'Image > Edit Mask'. Use the slider to adjust the image size. Drag the image to move the area you want into position within the mask frame.



6 EXPORT A PRESENTATION

To get your Keynote presentation on all your iOS devices you need to enable iCloud. Go to 'Settings > iCloud', sign in using your Apple ID and then turn on Documents & Data. Next, go back out to Settings, but this time tap Keynote and enable the Use iCloud option.



CREATE A COPY

To make a copy of your presentation, go to Presentations and tap the Edit button at the top right of the screen. Tap the one you want to copy and then simply tap the + icon on the left. Voila, you have a copy, with a number after it.

Get user information from a PowerPoint Presentation

Helen Bradley shows you how to get information from a user during a PowerPoint presentation using VBA.

While PowerPoint doesn't include a macro recorder you can still create macros using VBA to add functionality to your presentations. This month, we'll show you how you can get data from your viewer during a presentation and store it in a text file on disk.

Open your presentation in PowerPoint and add a slide or navigate to the slide that you will use for the interaction. Click the Developer tab (or choose 'File > Options > Customize Ribbon' and click Developer in the right-hand panel to enable it). Add a Label and a TextBox control.

Right click the Label, choose Properties and set its Caption property to prompt for the information – we asked for their name. You can format the Labels and the TextBox controls using their Font, Forecolor and other alignment and formatting properties.

Add other combinations of Label and TextBox and other controls for each piece of information you want from your user. We used two OptionButtons for a Yes/No reply.

Add a CommandButton and set its Caption property to read 'Submit' so the viewer can click it to submit their response.

Double click the CommandButton to open the Visual Basic Editor. You will be positioned automatically between the Private Sub CommandButton1_Click and End Sub statements, so type this between these statements:

```
Dim userResponse, todaysDate As String
'If file exists open it, if not create it
Open ActivePresentation.Path & "userResponses.txt" For Append As #1
todaysDate = Format(Now(), "dd-mmm-yy")
userResponse = "Name: " & TextBox1.Text
Print #1, userResponse
If OptionButton1.Value = True Then
Then
Print #1, "Harassment Module: Understood"
Else
Print #1, "Harassment Module: Not Understood"
End If
userResponse = ""
Print #1, userResponse
Close #1
'Message to viewer to confirm results submitted
MsgBox "Thank you. Please
```

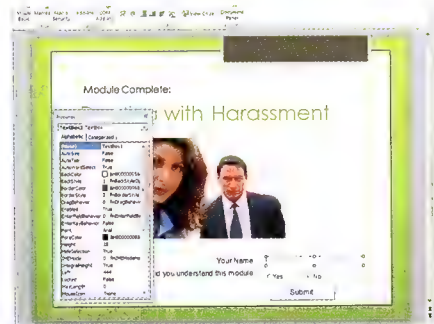
```
continue to the next module"
'Clear the text box and option buttons
TextBox1.Text = ""
OptionButton1.Value = False
OptionButton2.Value = False
'Go to next slide
SlideShowWindows(1).View.Next
```

Close the Visual Basic Editor and choose 'File > Save As' and save the PowerPoint presentation as a macro enabled .pptm file. To test the code, run the slide show, complete the details and submit the information. You will find the answers written to a text file in the same location as your PowerPoint presentation was saved.

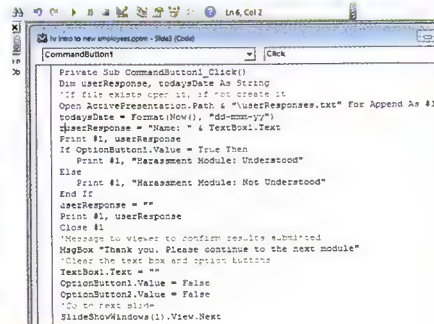
HOW IT WORKS
The code opens the text file userResponses.txt if it exists and creates it if it does not. It writes the date, the answers and an empty line to the file using Print statements. It then displays a confirmation message, empties the controls of the user data and moves to the next slide. This basic concept can be adapted to a range of uses including user feedback, quizzes and surveys. ■

Build the macro yourself

Find the macro file you need at www.apcmag.com/magstuff.htm



1 ADD CONTROLS
Add the controls using the Controls in the Developer tab in the ribbon. Right-click and choose Properties to set their properties.



2 SET UP THE CODE
Double-click the Submit button and then type the code.



3 TEST IT
Save the file and run the slideshow to test the code.

Painlessly restrain resource-hungry apps

Greenify offers an unobtrusive method to restrain background apps. Simon Chester shows you how it works.

In order to get the most out of your battery, your phone or tablet device enters a low-power sleep mode a little while after you turn the screen off. However, Android allows apps to wake your phone to perform tasks in the background. This allows some great features, but poorly coded apps – or just the cumulative effect of having many apps installed on your device – can end up affecting your battery life.

There are a number of ways that users have addressed this issue, but an app released only last year, Greenify, offers the easiest, most unobtrusive method for tackling this problem.

Greenify can hibernate those apps that regularly wake your device – but won't remove them from the system, meaning that they'll still appear in your App Drawer, Share Menu, Open With, and everywhere else you'd expect an app to appear. Better yet, it automatically and instantly enables them again when you go to use them.

Now, this alone is worthy of commendation. However, if you fork out the \$2.99 for the donation version (and run the root-only Greenify Xposed module) you get access to extra special features that make it even better – including being able to maintain push alerts from (certain) apps like Hangouts or Facebook Messenger.

While Greenify works on non-rooted devices, it gives a better experience for rooted users, so – as always – take the time to root your phone.

Once you've installed Greenify (the free version is fine for now), you need to press the plus button to add apps to the hibernation list.

The app selection list that appears is divided into categories based on the likelihood of the app affecting your battery/experience. So, let's make our way through these categories, selecting any apps that you wish to hibernate along the way:

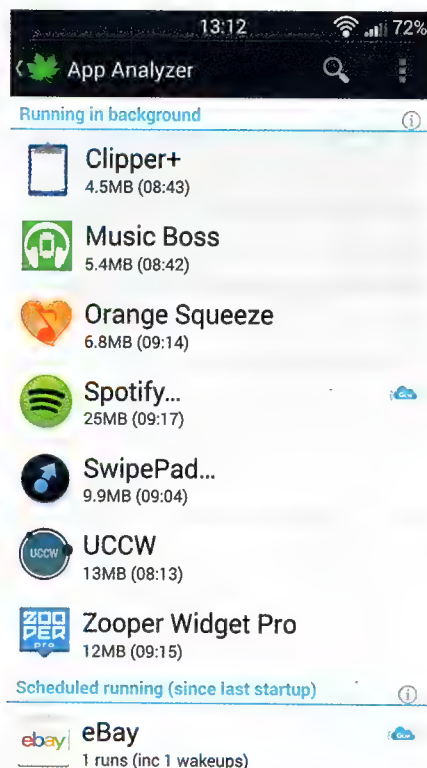
RUNNING IN THE BACKGROUND

First in the list are those apps that are currently running. You need to be selective here: don't hibernate anything that has a widget, is accessed (by you) frequently, or delivers a useful service. In my case, I chose almost nothing from this list. You should exclude any widget providers (in my case, that meant UCCW, Zooper Widget Pro, and Spotify), but I also avoided my music player remote controls (Orange Squeeze and Music Boss), my keyboard of choice (Swiftkey), a gesture-based shortcut app (SwipePad), and my clipboard manager (Clipper+).

SCHEDULED RUNNING (SINCE LAST STARTUP)

The next section lists those apps that are scheduled to run periodically

– these are the ones that may be draining your battery. Note that I only say may: what you need to look at here is the number of wakeups that the app has next to it. If this number is large (my Facebook + Messenger apps rated in the hundreds), then you would do well to select them. If the number is very low, then the effect of hibernating the app will be negligible, so it probably isn't worth it. Note that, if you recently rebooted your phone, all the numbers will be low, so I recommend that you check this list again after a few hours of use.



Apps that run in the background are listed at the top.

Xposed info

If you've not heard of Xposed before, it's a (root-only) framework that allows users to customise almost anything in their ROM – from theming system icons to obfuscating location information – by simply installing a module. I can't recommend it enough. For more information, see my How To in APC September 2013, or view an overview video (and follow the links in the description) at tinyurl.com/p3hadh7.

1 Greenify

battery leeching, memory hogging and stealthily running apps.

2 Enjoy

smooth and lasting experience just like on the first day.

3 Forget (root mode only)

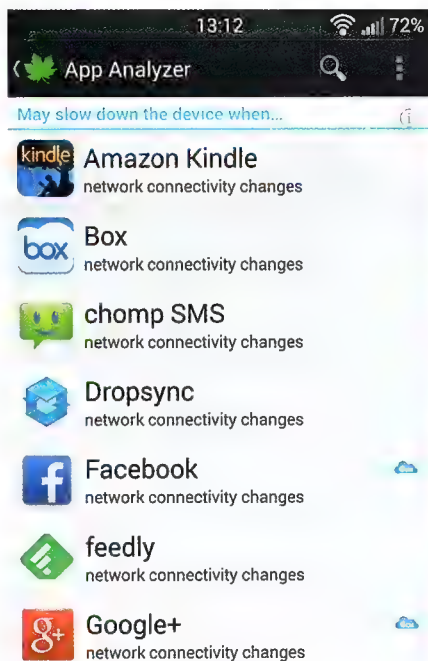
about house keeping, let Greenify silently do it for you.



Begin adding apps by pressing the '+' button.

Tasker plugin

Advanced users may also want to experiment with the included Tasker plugin, which allows Tasker's event logic to Greenify your list of apps (or a specific app of your choice).



Apps down the bottom of the list probably won't affect your battery.

MAY SLOW DOWN THE DEVICE WHEN...

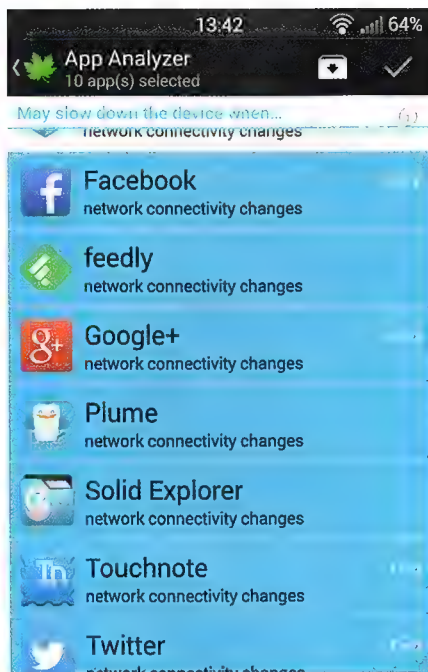
Third in the list are those apps that perform some task after a certain event occurs, such as a network connectivity change or you unlock your device. In terms of resource use, these tasks are usually fairly minimal, and likely won't cause a battery drain. If there is a great number of apps in this list, however, it may translate to occasional interface lag. You can experiment here with adding or removing apps to see if doing so has any adverse (or noticeable) effect.

Now that you've selected a number of apps, just press the tick in the top right corner to add them to the auto hibernate list. If you find that Greenifying an app has caused some problems, simply remove it from the list on the main screen by touching and holding it, then pressing the 'X' that appears.

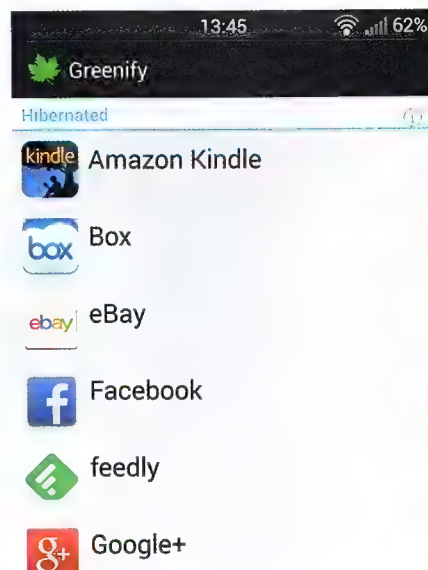
GREENIFY'S XPOSED MODULE

Perhaps the best features of Greenify are unlocked with its Xposed module. If you haven't already, open the Xposed Installer app and activate the Greenify module now (under the Modules section), then reboot your device.

The Greenify Xposed module (accessible from the 'Experimental features' menu option in Greenify) provides a few extra features on its own (even if you haven't opted for the donate version), including: 'Boost mode', which I can't say for sure makes a difference or not; maintain notifications for hibernated apps; the ability to track which app woke a Greenified app, and then prevent that



Select any apps you wish to hibernate, and press the '+' button



Hibernated apps are now listed on the main screen.

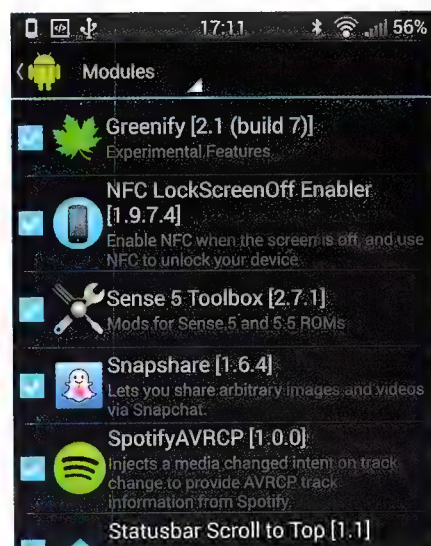
from happening again; and a largely deprecated ability to keep some rogue apps in check, which doesn't apply to Android 4.3+. I recommend selecting the first two.

However, if you fork out for the donate version (available as an add-on from the Play Store), you can additionally: hibernate apps, but still receive Google Cloud Messaging (GCM) push notifications for them (as long as the 'Keep Notifications' option is also selected); hibernate system apps (not really recommended); and allow telephony events (like phone calls and SMS) to wake hibernated apps.

It's important to realise that not all apps use the GCM service to receive push notifications. Apps that do are

Finding more rogue apps

You should also consider installing Better Battery Stats (\$2.74) to find those apps that are actually draining your battery (rather than just running in the background). However, there is a bit of a learning curve for the app, so I'd recommend reading up on it at tinyurl.com/425c5zb.



To get the most from Greenify, you should enable its Xposed module.



I recommend enabling the top three experimental features.

denoted as such in the Greenify app list by a little cloud icon to the right of their name. So, if your particular email, IM, or other app doesn't have this icon, then hibernating it will mean that you won't receive instant notifications from it – so keep this in mind before putting it to sleep. ■

Build a liquid-cooled micro-tower

Most people would never build their own small form factor PC, fill it with high-end hardware, liquid-cool it, then overclock it. Luckily, Tom McNamara's not most people.



The mission: The interest in small form factor (SFF) computing seems to have reached a fever pitch over the past few months, but boutique system builders tell us they've been selling an S-load of them for some time now. The reason for their popularity is not hard to understand — they pack all the firepower of a full-sized ATX machine but take up half the space due to clever engineering. It takes equally clever building to fit a full-sized video card, an internal power supply, storage devices, and even liquid cooling into such a tiny box. That's no small feat, and to be honest, it sounded like

just the kind of challenge that we wanted to take on for PC Builder. The problem is, the micro-tower form factor hasn't been around very long, so it still has some kinks to work out. We've worked with several of these systems over the past few months, and the degree of usability varies quite a bit. However, Silverstone recently announced the Raven RVZ01, a case that seems to have the ease-of-use that we like; plus, the company has demo'd the chassis using a liquid-cooling system, which we found downright nifty. All we had to do was get our hands on one and go to work.

BIRDS OF A FEATHER

To construct a PC inside a mini-tower like the Raven, you really have to be prepared to build in a completely different way than you have before, and using some atypical parts, too. For example, in this case (which is a preproduction model, so retail units might differ slightly) the optical drive bay only holds a slim design, as its front bezel is less than half the size of a standard 5.25-inch drive. The power supply is also not standard ATX: a Silverstone ST45SF-G from the company's SFF SFX line of PSUs designed for tiny rigs like this. It can't supply as much juice as a full-size ATX power supply because it's so small, but it's still able to throw down 450 watts. Surprisingly, this is actually enough wattage for a system with a single video card and a relatively efficient Intel Haswell CPU.

When we say single card, we mean any single-GPU card you can find, as there's more than enough room for even super-long boards. We stuffed an Nvidia GeForce GTX 780 Ti into our box and had plenty of room left over. (We could have fit a dual-GPU card, but the power supply wouldn't be able to handle that.) There's also enough room for a 3.5-inch hard drive in the RVZ01, in addition to two 2.5-inch drives, but we ended up sacrificing our 3.5-inch drive to the liquid-cooling gods. Since we were using an expensive CPU cooler, we figured we might as well go top-shelf all around, so we went with Intel's Core i7-4770K CPU and the Maximum VI Impact mobo from ASUS.

PREY DRIVE

Since this build it is more of an experiment than a full-fledged gaming or productivity system, we felt comfortable sticking to just one solid-state drive (SSD) for our storage needs. One of the main benefits of using just an SSD in a small system like this is that it cuts down on the cabling we'd need to wrestle with later, which can take up a surprising amount of space. An SSD is also much smaller than a desktop mechanical drive and makes no noise since it has no moving parts. In the RVZ01, SSDs are mounted on a detachable section that also holds the video card and the optical drive. This design makes the SSD quite easy to access, and adding a second drive is easy, too.



PARTS LIST

	PART	PRICE
CASE	SILVERSTONE RAVEN RVZ01	\$109
PSU	SILVERSTONE ST45SF-G 450W	\$115
MOBO	ASUS MAXIMUS VI IMPACT	\$325
CPU	INTEL CORE I7-4770K	\$396
COOLER	CORSAIR HYDRO H75	\$109
GPU	NVIDIA GEFORCE GTX 780 TI	\$890
RAM	16GB (2X8GB) CORSAIR VENGEANCE LP	\$205
SSD	CORSAIR NEUTRON GTX 480GB	\$589
OPTICAL DRIVE	SILVERSTONE SOD028X DVD BURNER	\$75
CABLES	SILVERSTONE PP05-E FLAT POWER CABLE KIT	\$35
OS	WINDOWS 8.1 64-BIT OEM	\$115
TOTAL		\$2,963

MOTHER-BIRDS

The RVZ01 features an inverted design, so we had to flip the ASUS Maximus VI Impact motherboard upside down and rotate it 180 degrees, which is why the connectors in the photo look backward. The case's side panel that's behind the motherboard tray is permanently attached, so we had to install the liquid cooler's backplate before we installed the motherboard. This motherboard also has a riser card that needs to be installed if you want to take advantage of the mobo's integrated sound. There's another optional add-in card that offers Wi-Fi and Bluetooth, which contains yet another connector, this time for M.2 – the successor to mSATA, which is designed for ultrabooks and other systems too small to fit an SSD. And there's a third pre-installed riser at the bottom of the board containing extra capacitors for overclocking. We removed the riser's two screws, because those holes double as motherboard mounting points. Then we put the I/O shield in the case, followed by the board.



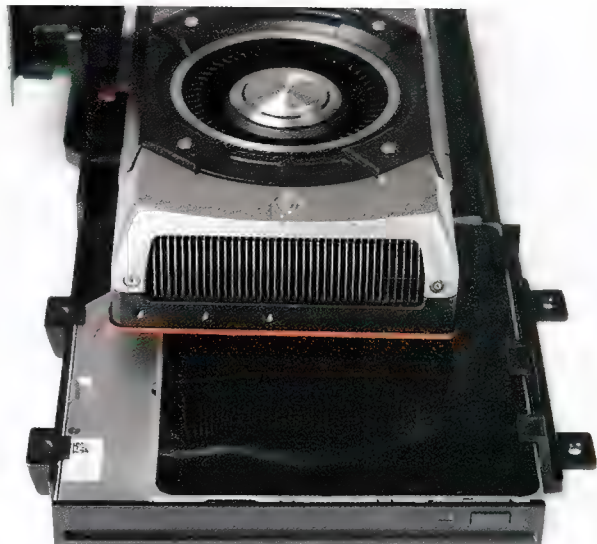
BIRD ON A WIRE

Inside this black cage is the junior-sized Silverstone power supply. The cage is attached to the case with four standard screws. Take those out, slide the PSU in with its connectors facing up and its intake fan facing toward the fan grill on the side panel, secure it to the bottom of the cage with the four provided screws, and put the whole thing back in. We routed most of the front-panel wiring underneath the cage, to leave more room up top for other wires. The short flat cables come from Silverstone's PP05-E flat power cable kit, which is sold separately from the PSU. They are highly flexible and a godsend in tight quarters like these.



EAGLE EYES

This removable ledge contains the optical drive and a platform for the GPU. As you can see, only a slim style of optical drive will fit, and luckily, Silverstone has one named the SOD02, which is an 8x DVD burner. Sure, it's not a BD-R drive and it's not cheap, but if you need an optical drive in this case, you don't have a ton of options. To install it you have to remove the top half of the case's interior by removing six Phillips screws around the rim, and the drive slides into the front. The mounting holes for the optical drive were too small for the heads of the screws that come with the drive, so we couldn't put them in. You need to use the screws that come with the case, instead. The drive was surprisingly snug without the screws anyway, so we just left it loose in the slot.



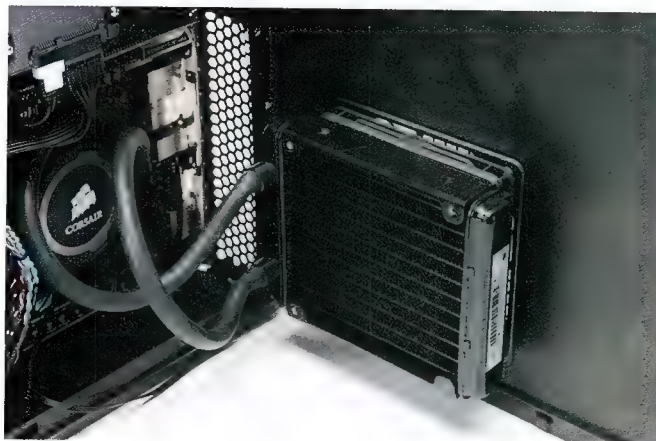
SPREADING OUR WINGS

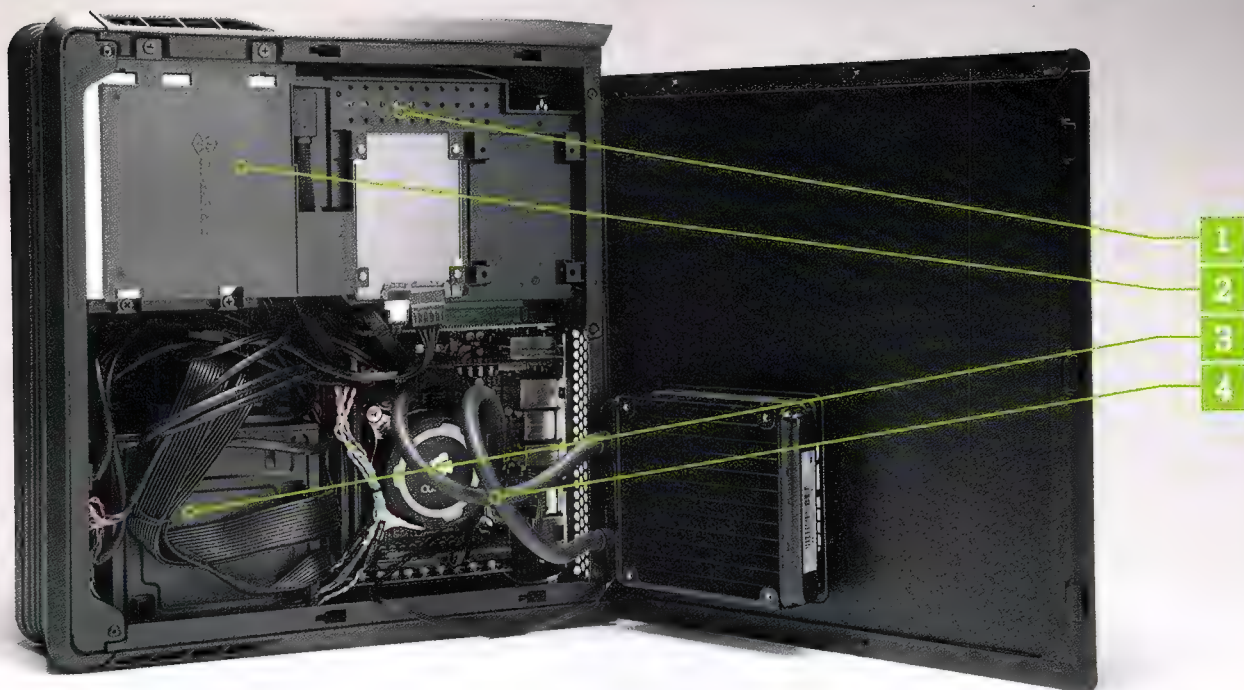
The detachable section is also where we installed the Nvidia GeForce GTX 780 Ti. We could shave some cash off this build and go with a more moderately tuned GPU like a GTX 760, but we wanted to see if both the case and PSU could handle a full-powered and full-sized GPU. We chose the GTX 780 Ti because it's currently the fastest single-GPU available, and produces a decent amount of heat, too. To install it, we had to first plug the GPU into a PCI Express riser card, then attach the PCIe power cables to the card before putting this entire section back into the case; the connectors on the card become inaccessible once it's installed. To make the cabling nice and neat (again, we used those flexible flat cables) we strung them behind the card and curled the cable over the top and into the connectors. Once everything was connected, we plugged the whole contraption back into the case, with the riser pictured below going right into the motherboard's x16 PCIe slot.



SURVIVAL OF THE FITTEST

CPU cooling duties were handled by a Corsair H75 unit, but to get it to fit we had to swap out the standard 120mm fan, which was too chunky. Instead, we used the slim fan that was pre-installed on the side panel. Although this fan allows us to install the radiator on this super-slim case and still get the door to close, the size of the fan blades mean it won't be able to move as much air as a larger fan. Also, since the fan is thinner we had to use shorter #6-32 3/4-inch machine screws that we bought at a local hardware store to attach it to the radiator. The H75 is a good choice for a small form factor case like this one because of its flexible and relatively narrow tubes. We looped the tubes toward the front of the case, then back, to keep them out of the way of the radiator. We experimented with intake vs. exhaust and push vs. pull; in the end, we went with push exhaust (though pull exhaust is shown in the photos).





1 The detachable section holding the video card gets its own 120mm slim intake fan, with room for a second one; video cards will not be starved for air.

2 The optical drive comes with a right-angle cable combining power and data; it's perfectly suited for the case's snug dimensions.

3 The PSU gets a small intake grill on the other side of the case; it exhausts heat into the case, however, which can complicate overclocking.

4 For a liquid cooler's tubing to fit in this case, it looks like it has to be no more than 1/4-inch thick and made of rubber for maximum flexibility.

SOMETHING TO CROW ABOUT

For a micro-tower, the RVZ01 has particularly accessible areas for the video card, storage devices, and power supply. We've had buzz-killing frustrations installing those components into smaller enclosures before, so the design of this chassis was definitely to our liking. Unfortunately, the case's smaller dimensions meant that cooling was a challenge. The GTX 780 Ti was getting plenty of air, but we struggled to push the CPU beyond its stock specifications. We first ran it up to 4.2GHz, but in extended testing under load, temps were hovering at 90°C when running the x264 encoding benchmark. That's not good, and too hot for our tastes. We've overclocked with the H75 in a tight space before, so we knew the cooler could handle the task. Upon investigation, we realised the case's stock slim fan that we attached to the Corsair H75's radiator doesn't have a lot of focused air pressure, so it's not great for cooling a rad. (Silverstone makes some excellent high-pressure fans, but they won't fit here.) There's also no intake fan in this part of the case, and no exhaust fans at all. Because of these issues, we ended up running the CPU at stock clocks, but with the motherboard's "Multi-Core Enhancement" pushing all CPU cores to the same speed when under load. Without MCE or manual tweaking, several cores will run below the chip's turbo boost rating of 3.9GHz.

We had much better luck with the video card. Despite the GTX 780 Ti having a stock cooler, we were able to overclock the core by 100MHz and the memory by 400MHz (effective), thanks in part to the 120mm intake fan right next to the card. At 4K/UHD, we sustained over

BENCHMARK RESULTS			
	ZERO POINT		
PREMIERE PRO CS6 (SEC)	2,000	2,544 (-21.2%)	
STITCH.EFX 2.0 (SEC)	831	829	
PROSHOW PRODUCER 5.0 (SEC)	1,446	1,415	
X264 HD 5.0 (FPS)	21.1	17 (-19.5%)	
BATMAN: ARKHAM CITY (FPS)	76	78	
3DMARK11 EXTREME	5,847	5,393 (-7.7%)	

THE ZERO-POINT MACHINE COMPARED HERE CONSISTS OF A 3.2GHZ CORE I7-3930K AND 16GB OF CORSAIR DDR3/1600 ON AN ASUS P9X79 DELUXE MOTHERBOARD. IT HAS A GEFORCE GTX 690, A CORSAIR NEUTRON GTX SSD, AND 64-BIT WINDOWS 7 PROFESSIONAL.

80 FPS in *Batman Arkham City*, with just PhysX and anti-aliasing disabled. A more demanding game like *Hitman Absolution* was in the mid-40s, and *Tomb Raider* (2013) was in the low 30s. That's still very respectable for a single GPU with a stock cooler. Our seemingly "underpowered" 450-watt power supply chugged right along and was totally stable. We plugged in a power meter and discovered that the system didn't draw over 350 watts during the gaming benchmarks, which would be the heaviest real-world usage.

This build was an experiment from the start, so a lack of CPU overclocking was more a learning experience than a shortfall. There's only so much space in a micro-tower to get fancy with CPU cooling. You're probably better off with a cube micro-tower for that. ■

Project #16 – Audio Spectrum Analyser

Don't just listen to your music – see it with this Arduino-powered Stereo Audio Spectrum Analyser. Darren Yates explains how.

If you've been following our Arduino masterclass for the last little bit, you'll know we've been concentrating on analog-to-digital converters (ADCs). Without these little electronic circuit elements, there's no grey, no shade, no colour – everything is black and white, one or zero. ADCs are the glue that joins the real analog world to the digital precision of the computing environment.

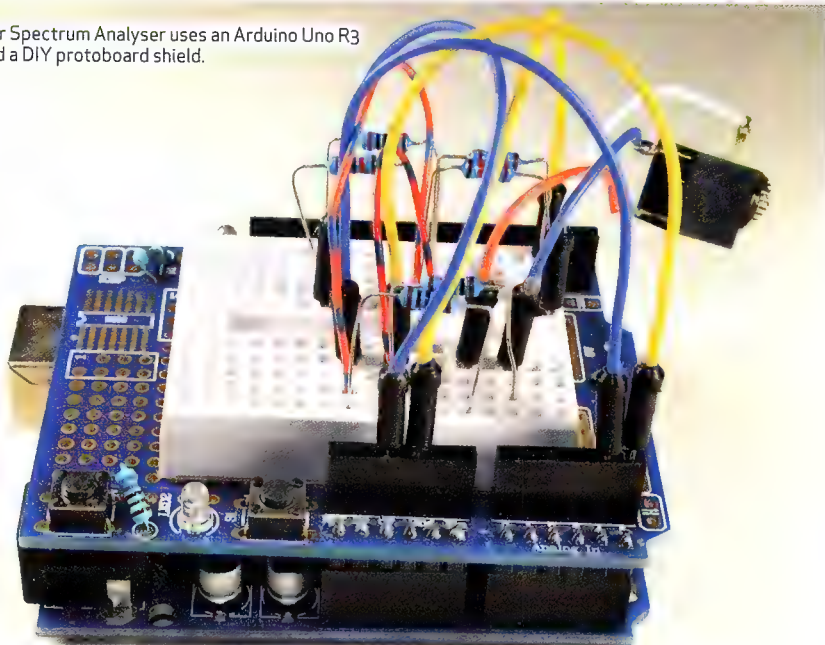
We've already had a look at ADC theory and last month, we put some of that theory into practice, building a stereo peak program meter (modern day VU meter). This month, we crank things up further, introducing a bunch of new components and some head-spinning maths as we build an audio spectrum analyser.

THE SPACE-TIME CONTINUUM

When I first saw *Back to the Future*, Doc' Brown was cool, mostly because of his awesome electronics man-cave, but I digress. You know the basic time-travel story – that instead of seeing time as one-dimensional, you can travel through it, like scrubbing through an MP3 track to your favourite part on your iPad.

When an ADC grabs samples of an analog signal, it's taking regular samples of that signal, capturing its amplitude over time. Do this in real time and you can display that amplitude, which is exactly what our stereo peak program meter did last month. If you line up those samples

Our Spectrum Analyser uses an Arduino Uno R3 and a DIY protoboard shield.

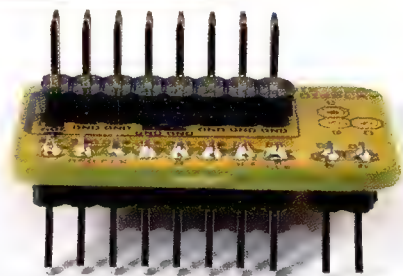


one after the other, you can see a record of that signal. Play those samples and you get your original signal back – exactly what any digital audio player does.

However, you're looking at only a one-dimension view of that signal. Just like *Back to the Future*, there's another way you can view those samples – and that's by frequency.

Back in the early 1800s, French mathematician Joseph Fourier came up with an idea that you could break down any repeating mathematical function into a series of trigonometry equations (sine and cosine). German maths freak Carl Gauss turned the idea into a mathematic transform around the same time, but it wasn't until 1965 when Jim Cooley from IBM and John Tukey from Princeton University found it could also be applied to computers. These guys figured that you could take a series of discrete samples of an analog signal and break it down into its frequency components using what's now called the Fast Fourier Transform (FFT).

Now when it comes to audio, the most pure sound is a sine wave – it consists of just one tone or 'frequency'. It has zero distortion, it is



This connector plugs the display into the protoboard shield (ribbon cable red stripe to the left).

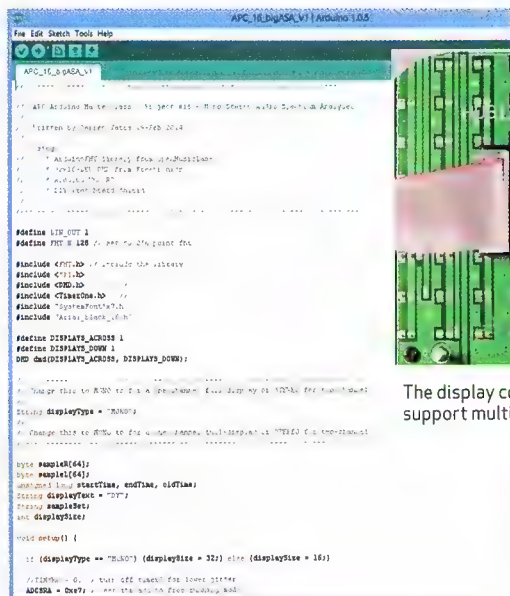
audio perfection. But Fourier's idea is that every sound you hear, every song you listen to is just made up of a complex array of sine and cosine waves at varying frequencies and amplitudes. And the FFT is the tool you use to get those frequency and amplitude components. This might sound a bit *Back to the Future* again, but the process is called converting the signal from the time domain into the frequency domain.

SO ARDUINO CAN DO MATHS?

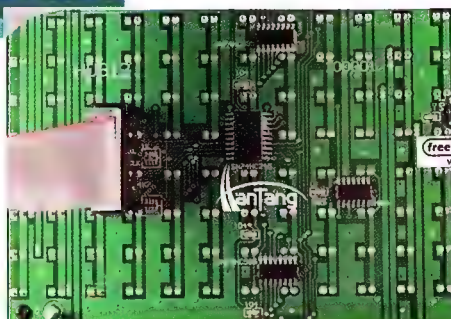
Arduino is cool for moving robots, quadcopters and flashing lights on and off, but the modest 16MHz/8-bit Atmel ATMEGA328P microcontroller is also capable of some seriously nifty

Where to get the code

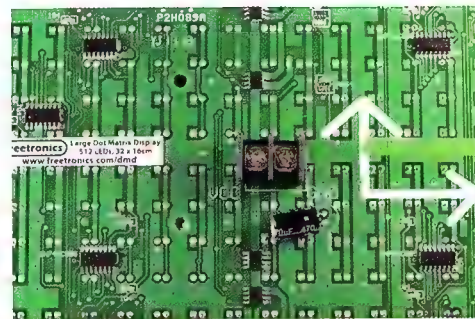
As usual, you'll find the sketch (Arduino for 'source code') on our web site at apcmag.com/arduino.htm. Copy the contents of the library folder into the libraries subfolder in your Arduino IDE folder and load the .ino sketch file into the IDE. We used version 1.0.5 to build the app. Note that there is some minor unavoidable display flicker as the SPI interacts with the ADC.



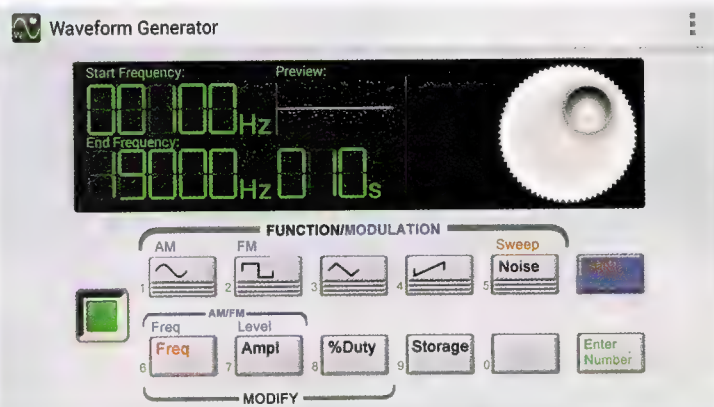
The sketch source code is loaded into the Arduino Uno via the Arduino IDE



The display connects via ribbon cable and can support multiple panels.



The display supports external power for super-high brightness but needs up to 40-amps.



The Waveform Generator app from Google Play turns any phone into a signal generator.

"Doc' Brown was cool, mostly because of his awesome electronics man-cave, but I digress..."

mathematical gymnastics.

FFTs creates some pretty complex numbers, so complex that they have two components – a real and an imaginary component. If this maths talk is starting to make you break out into cold sweats, don't worry, we're almost done – suffice to say that in our application here, we don't need the imaginary part; we just need the real part. The FFT is reasonably quick but since the Arduino Uno is a little skinny on speed, we're using a mathematical cousin called the Fast Hartley Transform (FHT), named after US electronics engineer Ralph Hartley, who invented the mathematical transform named in his honour during World War II.

But rather than having to code this complex mathematics ourselves, the team over at OpenMusicLabs have turned this FHT into an Arduino library and once we capture our audio signal samples, it's this ArduinoFHT code that does the heavy lifting, turning those time-domain amplitude samples into discrete frequency-domain components.

ADC SETUP

Over the last couple of months, we've talked about the ATMEGA328P's ADC setup and how it defaults to a sample rate of 9.6kHz through a division of the 16MHz clock, a 128-prescaler or divider and the 13 clock cycles it takes

to capture one sample. From Nyquist's Theorem, we know the effective bandwidth is half the sample rate, or 4.8kHz – and that's not great.

But by knocking down the 128-prescaler to 32, we now increase the sample rate by the same factor up to 38.4kHz. Thanks to Nyquist again, that gives us an audio bandwidth of 19.2kHz, which is close enough to 20kHz-perfection.

Remember back two months ago we looked at the ADCSRA (ADC Control and Status Register A) register and the last three bits that set this prescaler. By setting the register to hex number 0xf5 in our sketch, we set the prescaler to 32 and the 38.4kHz sample we're after:

```
ADCSRA = 0xf5;
if (sampleSet == "L") {
  ADMUX = 0x45; // use
  adc5
} else {
  ADMUX = 0x44; // use
  adc4
}
```

The ADMUX controls which analog pin we're sampling from – we take the left channel from analog pin A5 and the right-channel from pin A4.

WHAT DO WE GET?

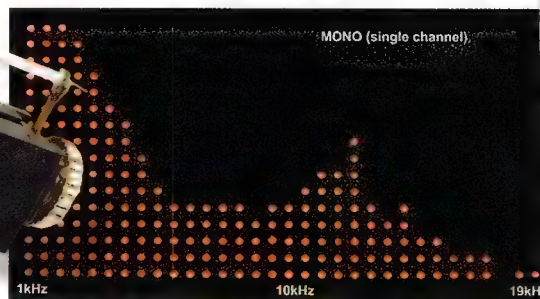
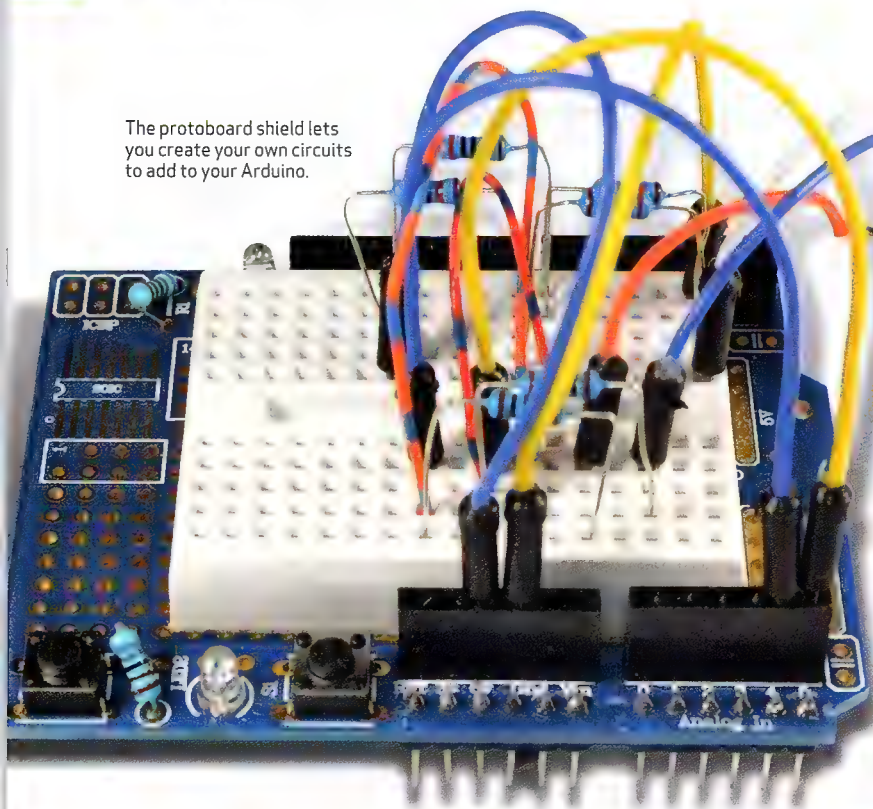
Combine all of this together and what we eventually end up with is an array

Get an audio sweep function generator for \$1.50

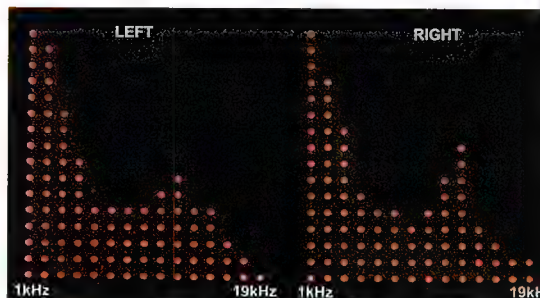
The most practical way to test an audio spectrum analyser is to run an audio signal through it. But ideally you want a continuously varying sinewave to ensure each bin and each LED column work as expected. This 'continuously varying' signal is called a frequency sweep and it's a function you find on most decent (expensive) signal generators, test equipment you'd find in any well-equipped lab.

Chances are you probably don't have one, but if you have an Android smartphone or tablet, how does \$1.50 sound? Grab hold of Waveform Generator from Google Play and it turns your Android device into a brilliant signal generator that creates sine, square, triangle and sawtooth waveforms, generators white, pink and brown noise, creates AM (amplitude modulation) and FM (frequency modulation) signals and has an exceptional frequency sweep function. If you want to dip your toe into electrical engineering, this is a must-have app!

The protoboard shield lets you create your own circuits to add to your Arduino.

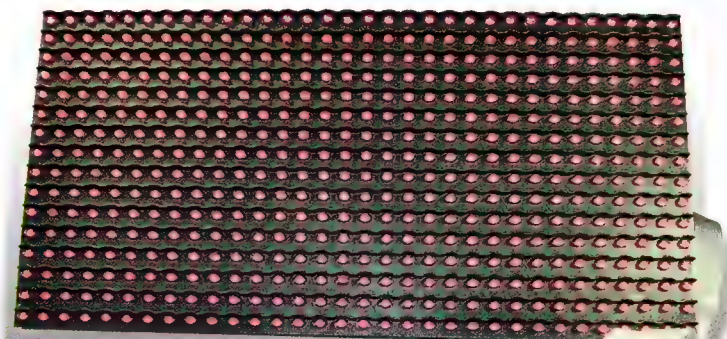


The analyser's single-channel display option output covers frequency linearly.

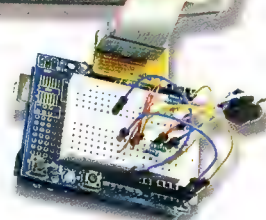


The stereo option lets you see both channels on the one display.

"It's still a pretty fun way of combining ADC theory with music and lots of flashing lights."



The Spectrum Analyser uses this 32x16-LED panel from Freetronics.



of coefficients where each array element represents a frequency band or 'bin' and the coefficient in that bin is the amplitude of that frequency band. (An array is a series of variables assigned to one key or name through an index or address. Think of a block of units — each unit is an element that belongs to that block).

The width of the frequency band is calculated by dividing the sample rate by the number of steps in the FHT (usually set as a binary-compatible number). The more steps, the narrower the frequency band each bin covers and the greater the precision.

If your head hurts half as much as mine after reading those two paragraphs, here's an example - if we're covering a basic 20kHz signal bandwidth, setting the FHT size to 16 means we're dividing that bandwidth into 16 equal-sized sections, each covering 1.25kHz. The first bin covers 0 to 1.25kHz, the second 1.25 to 2.5kHz and so on. But if we set the size to 32, each bin now covers just 0.625kHz. Using 64 bins drops that to 312.5Hz and so on. The more steps,

the greater the precision you can record the frequency spectrum.

In effect, we've got a visual equivalent of a graphic equaliser. The difference is that where we have linear frequency steps, a graphic equaliser typically works on an 'octave' scale, where each step might be one, a half or a third of an octave (an octave is a doubling of frequency, so A below middle-C on the piano is 440Hz; the next A up is 880Hz, the one after that 1760Hz and so on).

While the ArduinoFHT library has an octave bin step function, unfortunately, we couldn't get it to work reliably, so we've stuck with the linear step pattern instead.

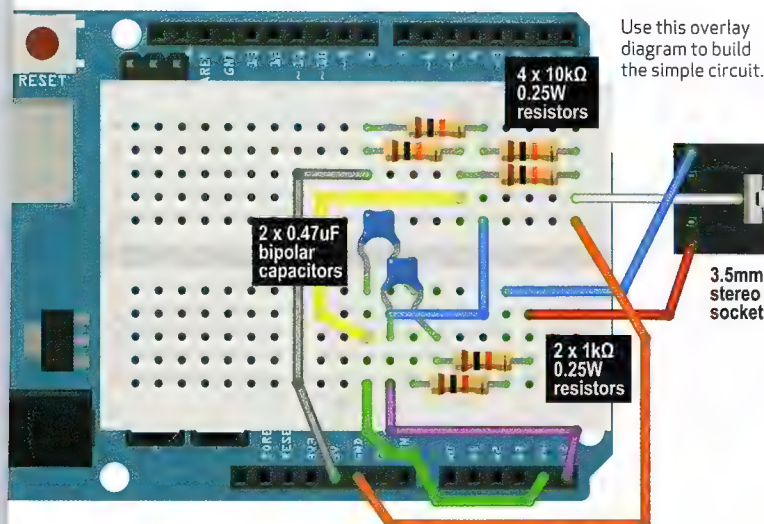
HOW TO DISPLAY IT

Now imagine that each bin is represented by a column of LEDs and the coefficient in each bin lights up a proportional number of those LEDs. You've now got yourself a very simple but functional audio spectrum analyser.

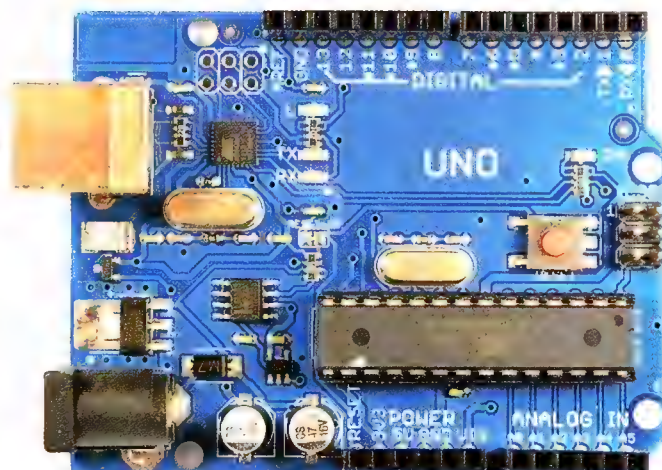
Rather than manually wire up a huge bunch of LEDs (yuck!), we decided to go for something a bit funky for this

project and we've hauled in a huge 32 x 16 LED Dot Matrix Display (DMD) from Australian company Freetronics. The red version sells for \$40 from Freetronics' online or any Jaycar Electronics store. What we love about this display is that you can drive it directly from an Arduino Uno R3 — and more importantly, it only needs a few digital I/O lines to do it. It uses the Arduino's SPI (Serial Peripheral Interface) to control all 512 LEDs in the display and is the fastest interface the Arduino has.

The DMD is bright, even running just off the Arduino itself, but it has an external power input to really make it shine — but be warned, you need a 5VDC power supply capable of supplying up to 40-amps (we suggest an old PC PSU or something similar — check the DMD instruction page).



Use this overlay diagram to build the simple circuit.



The Arduino Uno R3 features Atmel's 16MHz/8-bit ATMEGA328P microcontroller.

INPUT TO THE ADC

Last month, we built our peak program meter on a sizeable breadboard. But although we still need the analog input circuit from that project here, we don't need such a big board. So instead, we're using a compact DIY protoboard shield that includes a tiny, weeny 170-tiepoint breadboard you glue to the shield board using the supplied double-sided tape. The adapter cable for the DMD plugs into the shield, which goes into the Arduino.

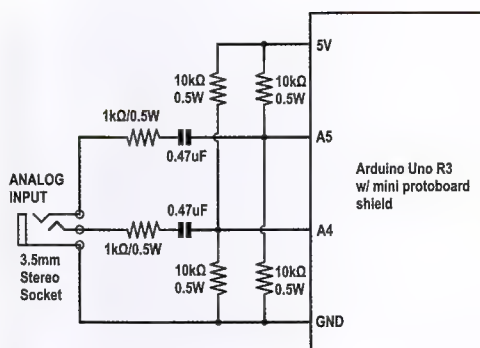
As we mentioned last month, the ADC needs the analog signal moved or 'biased' to half the supply voltage to ensure it not only measures it correctly but so the analog voltage doesn't damage the ADC. We have two sets of two 10kohm resistors providing a half-way voltage divider for the two analog input pins, A4 and A5. The two capacitors provide DC-blocking (ensuring no DC voltage from the signal source enters the Arduino circuitry). The 1kohm resistor in series with each capacitor ensures that an audio signal with amplitude greater than 2.5VDC peak can't seriously overload the Arduino ADC input and cause any damage.

TWO MODES

For added versatility, we've created two operating modes for our Spectrum Analyser — you can run it in mono (single-channel) mode where you use the full 32-wide LED array to display the frequency domain of the left-channel; or you can show two-channel stereo — left channel on the left, right on the right. In stereo mode, there is a two-column gap in the middle for delineation and you obviously get less detail since you only have half the columns.

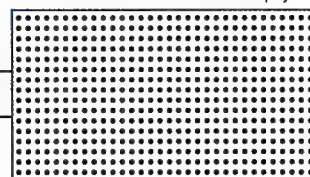
To change modes, you edit a line of code in the Arduino sketch — you enter 'MONO' for single-channel or

The circuit for our Spectrum Analyser.



Freetronics 32x16 LED Dot-Matrix Display

Freetronics DMD Interface (DMDCON)



apc Stereo Audio Spectrum Analyser

STEREO AUDIO SPECTRUM ANALYSER - PARTS LIST

COUNT	PART	COST	FROM
1	ARDUINO UNO R3	\$15	EBAY, ONLINE SUPPLIERS
1	DIY PROTOBOARD SHIELD	\$10	EBAY, ONLINE SUPPLIERS
1	FREETRONICS 32X16 DMD	\$40	FREETRONICS, JAYCAR ELECTRONICS
4	10KOHM 0.5W RESISTORS	\$1	JAYCAR ELECTRONICS
2	1KOHM 0.5W RESISTORS	\$1	JAYCAR ELECTRONICS
2	0.47UF BP CAPACITORS	\$3	JAYCAR ELECTRONICS
1	3.5MM STEREO PANEL SOCKET	\$3	JAYCAR ELECTRONICS

'STEREO' for dual-channel display. The sketch code does the rest.

GIVE IT A GO

So there you have it — a spectrum analyser powered by a low-wattage 8-bit microcontroller.

We don't claim this to be the world's most accurate spectrum analyser, but it's still a pretty fun way of combining ADC theory with music and lots of flashing lights. (Now if only we could just get a flux-capacitor in there...) ■

More on the ArduinoFHT library

This project wouldn't be possible without the brilliant work by the team at OpenMusicLabs who created the ArduinoFHT library. To learn more about how it works (and we seriously recommend you do), check out the Wiki page at wiki.openmusiclabs.com/wiki/ArduinoFHT.

The kernel's secret spices

Not keen on flashing a custom ROM but still want to improve your phone? A new kernel could be the answer. Darren Yates explains.

The most common reason to change a ROM in an Android device is to get hold of a release that's newer than your phone provider can deliver.

Samsung's Galaxy S3 is a perfect example – at time of writing, it only has a Jelly Bean/4.1.2 status, but online, there are numerous custom KitKat/4.4 ROMs available. Still, a custom ROM doesn't suit everyone, particularly when the stock ROM has proprietary features you want that a ROM built on AOSP (Android Open-Source Project) may not have.

One alternative to a full ROM swap that we looked at last month is the new Xposed Framework that allows you to tap into the OS and create new modifications. But another, more direct option is to flash a new kernel.

GET THE KERNEL

Every OS has a kernel – even Windows! Briefly, it's the section of the OS responsible for allowing software and hardware to communicate with each other. It's here you'll find hardware device driver code to run your phone's more specific functions – everything from Wi-Fi to Bluetooth, CPU, battery charging. You name it and it's likely handled by the kernel.

But in the interests of security, stock ROMs are generally locked down as tight as a drum, which means you can't get too funky with exotic settings. That's resulted in developers creating their own custom kernels to open up some of those extra features, the most common being overclocking and undervolting.

Overclocking a modern quad-core-powered phone might sound a bit extreme since the modest boost in performance comes at the expensive of heat and battery life. But undervolting can deliver greater benefit – in conjunction with overclocking, it can help reduce heat production but separately, it may help improve your device's battery life with only a modest loss of performance.

CHOOSING A NEW KERNEL

Choosing a valid ROM for your device might seem a bit of a task – you can't just install any ROM; it has to be one that's designed for your particular phone. But that can seem like a walk in the park compared with finding a valid kernel. Not only does a kernel have to

work with your phone, it also has to work with your phone's particular operating system. For the Galaxy S3, things are complicated by the two CPU variants – Qualcomm's Snapdragon and Samsung's Exynos 4412.

Further, all kernels are designed for a specific OS release – whether it's the stock ROM, the base AOSP release or one of the major custom ROMs such as OmniROM and CyanogenMod.

So why all the fuss? Simple – the wrong kernel will very likely brick your phone, so it's not something you do without a decent amount of

research. However, the potential improvements and function gains usually outweigh the risks involved. For starters, apart from the obvious need to do a Nandroid backup beforehand as insurance, flashing a kernel doesn't require you to change your whole phone setup like a new ROM can.

To show you how it's done, we'll take our Galaxy S3 (GT-I9300) phone with OmniROM KitKat/4.4.2 on-board and flash it with the latest stable Boeffla kernel. (Just be aware that with other devices, your mileage may vary.)

WHAT YOU NEED

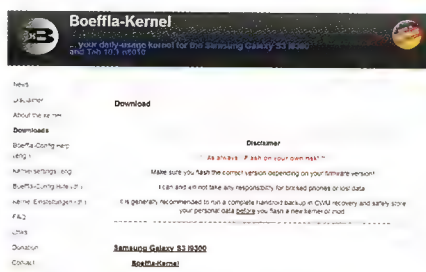
To flash a custom kernel, you typically only need three things:

- A device with root access
- Custom recovery capable of flashing update.zip files.
- OS-specific custom kernel.

Root access is a must here – nothing works without it. Once the kernel is in, you can remove root access if you prefer, but that makes configuration a bit tricky down the track. We've covered how to get root access numerous times previously and you'll find the details on our APC web site at

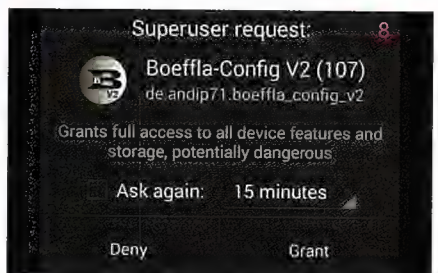
WARNING

Flashing your phone with any firmware will void its warranty and always includes the risk it may brick your phone. While we have tested this procedure ourselves successfully, the information is supplied 'as is'. It comes with no warranty or support – you use it at your own risk. Always perform a full Nandroid backup before flashing any device.



1 GRAB THE DOWNLOAD

Download Boeffla from tinyurl.com/pqcn7m9. At the risk of sounding like a broken record, make sure you pick the right kernel. There are versions for Samsung Stock/4.1 and 4.3, CM10.1/10.2/11.0 and OmniROM. OmniROM KitKat/4.4.x kernels are labelled as 'OmniROM CM11.0' since OmniROM's origins lie with CyanogenMod. If you want bleeding edge, choose one of the 'current test kernels' available, or if you still have your training wheels on, stick with one from the 'Stable Series'. (We'll go with the 'Stable Series' for this demo but the install process is the same for the other).



2 ENSURE YOUR PHONE HAS ROOT ACCESS

XDA senior developer Chainfire has an excellent auto-root mini-ROM called CF-Auto-Root that works like a dream on the Galaxy S3. You'll find it at autoroot.chainfire.eu/. It even includes Samsung's own internal-use Odin flash utility you can use on your Windows PC to flash it. For us, it just always works. Be warned though – if your Samsung device uses KNOX security firmware, any flashing will permanently trip it and void the warranty.

apcmag.com/how-to-root-your-android-phone.htm. We won't say the way we do it is the only way to root your phone, but it works consistently well for us.

The simplest way to install a kernel is via a custom recovery — the two most popular are ClockworkMod Recovery (CWMR) and Team Win Recovery Project (TWRP). They're both great — we'll use CWMR in this example.

And finally, you need a custom kernel — remember, it must have been designed not only for your phone but for your specific ROM, whatever that is. The Boeffla kernel is one of the more popular options for the Galaxy S3 — it still sees continued development and importantly for us, there's a version for OmniROM KitKat/4.4.

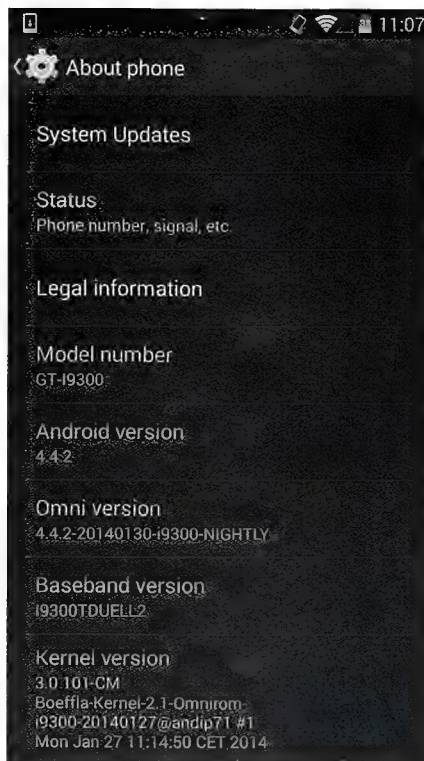
Follow the step-by-step guide below to see what you need to do.

SETTING UP THE KERNEL

Now that your custom kernel is installed, you'll have lots of feature candy to play with, but be warned: with such power comes responsibility and if you stuff it up, you bear the consequences.

At first, you'll probably wonder if it installed at all because you should see absolutely nothing different. Kernels don't make a big splash. To be sure it's there, go to Android's Settings/About phone menu and scroll right down to Kernel version where you'll see the build details.

To setup the kernel's features, the simplest option is to use a configuration tool. Some kernels include a config tool, but not all. If not,

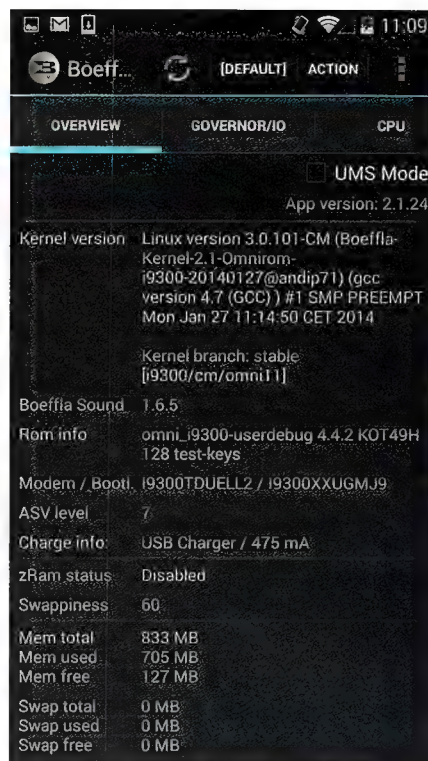


Check the end of the 'About phone' page in Settings for the kernel version.

STweaks from Google Play may fill the gap (check compatibility with the kernel developer). Boeffla has two purpose-built config tool versions on Google Play. If you're using OmniROM's KitKat/4.4 ROM for the Galaxy S3, you want Boeffla-Config V2.

WHAT CAN IT DO?

Config tools are the equivalent of Windows' Control Panel and give you



Boeffla-Config V2 is the 'control panel' for the OmniROM Boeffla kernel.

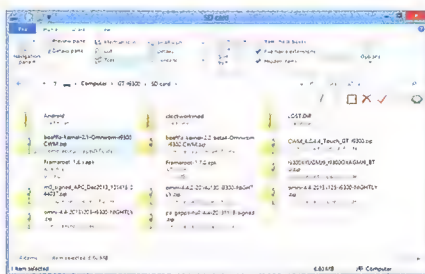
an eyeful into the kernel itself. For instance, Boeffla on the Galaxy S3 tells you the ROM info, memory allocation and other useful tidbits including charging status and charge currents plus time breakdowns in the various CPU clock states.

And that brings us to the main reason why many custom kernels exist — CPU/GPU clock/voltage manipulation. Whether you want to



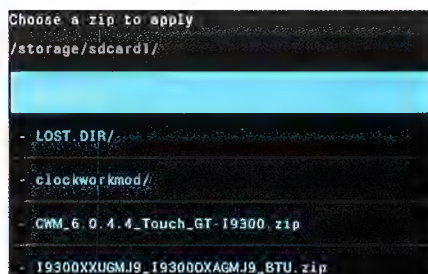
3 GET THE LATEST CWMR

CF-Auto-Root will root your phone, but it still leaves you with Samsung's stock recovery. To fix that, head to Google Play and grab ROM Installer. Launch it, select CWMR Touch from the Recoveries menu and ROM Installer will download the latest version (6.0.4.6 at time of writing), install it and reboot your phone.



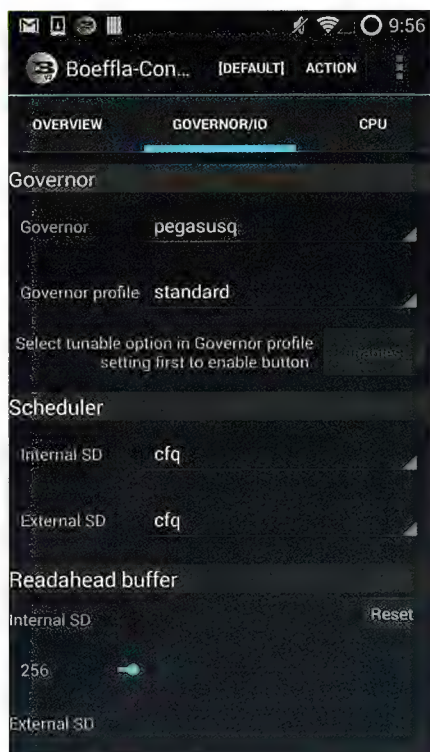
4 COPY THE KERNEL .ZIP FILE TO YOUR PHONE'S STORAGE

You can use internal or external storage for this, since we're not wiping the whole ROM. Just copy the whole kernel .zip file as you downloaded it — don't unzip it first.



5 BOOT YOUR PHONE INTO RECOVERY MODE AND FLASH THE KERNEL ZIP FILE.

For the Galaxy S3, this means turning off the phone, then re-booting by pressing the power, home and volume up buttons simultaneously until you see the Samsung splash screen. When the ClockworkMod Recovery menu appears, select 'install zip', navigate to the appropriate storage location using the volume buttons and tap Home to select the file. Once installed, navigate back out and reboot your phone.



Apart from loads of info, the config tool lets you set power governors.

make it run faster, slower, use less power some of the time or all of the time, the kernel is where it all happens. In fact, this is such an important (and potentially dangerous) area, it really needs its own masterclass, rather than try to cover it lightly here. NOTE: If you're new to custom kernels, we recommend you leave these specific options well alone unless you know what you're doing.

POWER MANAGEMENT

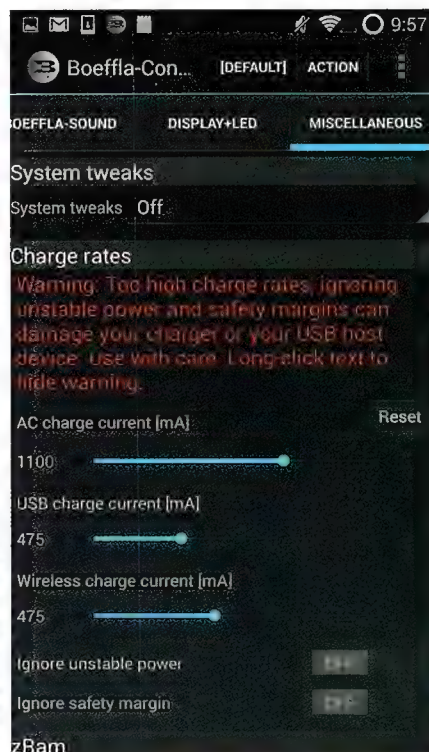
Kernels allow you two forms of CPU/GPU speed control — you can get down into the individual clock speeds and manipulate how they work, or you can use the 'governor' control. A governor is a Linux control mechanism that automatically regulates CPU clock speed based on various factors. Every Android device runs one, the idea coming from early steam engines that used mechanical governors to regulate engine speed.



Boeffla-Config can set CPU voltages, but it's risky.

In all, there are over two dozen different governors Android supports but most kernels will only give you a handful. The default governor in Boeffla is pegasusq. It's designed for multi-core CPUs running multiple processes and aims to ensure each process gets a fair-go at system resources.

However, lulzactiveq is popular — its operation is also fairly easy to understand. Modern phone CPUs have many different clock steps — for example, the Exynos 4412 can land on any clock speed from 200MHz to 1.4GHz in 100MHz steps. Lulzactive works by looking at the CPU load (the amount of processing demand as a function of time) and if the load is greater than 60%, it increases the clock speed up to the next available step. The idea is that a higher clock speed gets through the processing demand faster and lowers the CPU load — but also increases power drain.



You can even set the battery charge current for AC and USB environments.

When that CPU load drops below 60%, the clock speed drops down a notch, slowing the CPU and reducing the power demands. A car with continuously variable transmission (CVT) is a decent analogy here — the car's engine achieves maximum power efficiency at a particular angular velocity on the driveshaft and the car's gearbox continuously runs up and down the gears to suit the terrain and maintain that velocity. So, Lulzactive is a variation that works on a fixed CPU load instead.

Perhaps the most common governor is 'ondemand' — it aims to always stay at the lowest CPU clock speed until needed and instantly ramps up to the maximum defined level.

Bottom line, governors are about the compromise between CPU speed and battery life and where on the sliding scale you sit your device.

GIVING YOU CONTROL

The reality is that CPU and phone designers build in far more features than you ever actually get to play with using standard software, something that's essentially true for any device with a CPU inside. Custom kernels are about digging into the depths of the device, looking for that 'hidden gold' and bringing it to the surface. For the average newbie, the potential risk of device bricking this brings is far too real. But in the hands of experienced users, it gets you closer to ultimate control over your tablet or phone. ■

What about going back?

If you don't like your new custom kernel and want to go back to original, we can think of three options:

Grab a dump of the original kernel before you flash and flash it back — this requires an app, however. Few exist but Hellcat's kTool for certain Galaxy S2/S3 variants can grab a dump and re-flash it. It's free but needs root access and comes with the usual caveats.

Locate a source of the stock kernel for your particular ROM and flash that.

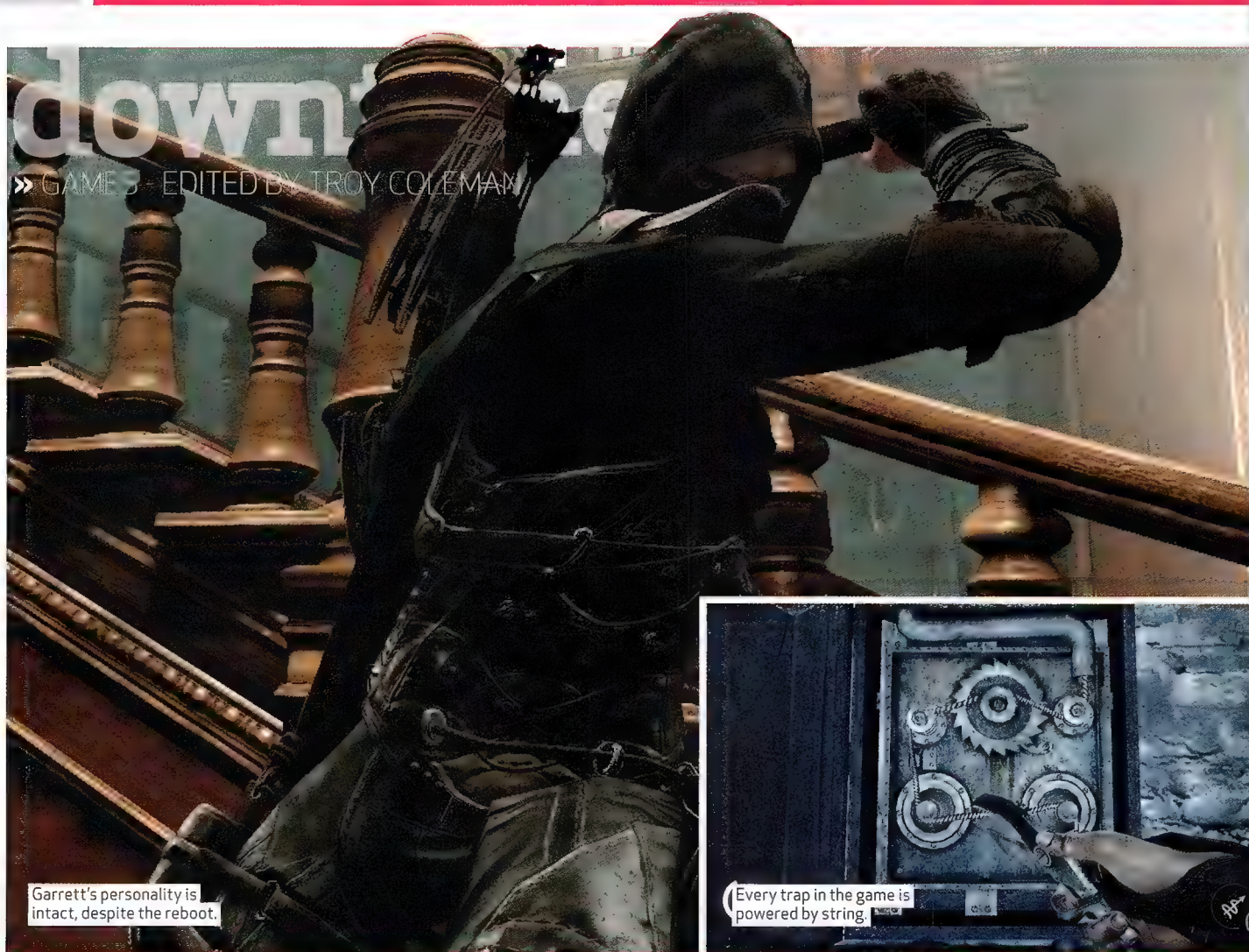
Re-flash your current ROM — this doesn't normally affect user or app storage partitions but its effect is to restore your previous kernel. Of course, any ROM functions or updates added after the ROM build date are lost. Also, make sure you do a Nandroid backup beforehand.




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down
» GAMES EDITED BY TROY COLEMAN

Garrett's personality is intact, despite the reboot.

Every trap in the game is powered by string.

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Thief

Gets the details right, but misses the grand prize.

Let's start with the good news. Eidos Montreal has listened to negative feedback from fans of the *Thief* series and dialed back on quicktime events and slo-mo nonsense.

Beyond the standard spread of difficulty modes, custom settings enable purists to disable everything they feel intrudes on their game. You can play *Thief* with campaign-spanning permadeath, quicksaves disabled, or the stipulation that being detected at all constitutes mission failure.

CRACKING START

After a tutorial on the rudiments of stealth, *Thief* opens strong. The first wave of relief hit early, during a jewellery shop heist mid-way

through the opening chapter. I'd jimmied a rear window and slipped in, swiping cups and inkpots from shelves before sliding into a side room where a guard lay dozing in an armchair. I extinguished some candles and, in the dark, began to crack a safe embedded in the wall. This involves a simple minigame where each tumbler is unlocked by feeling for a sweet spot. Crack it at the right time and the action is silent: fail and the lock clicks loudly. I failed on the second tumbler.

The guard woke up, but remained in his chair. I darted behind it and waited until he went back to sleep, listening to the sound of his breathing. I always played *Thief* games for these near-misses, and in that

instant I felt like Garrett again. On a moment-by-moment level, *Thief* delivers on the fantasy of being Garrett as well as – if not better than – its predecessors. Much is owed to the way the game feels. The entire game takes place at night, but colour is used to distinguish areas and make it clear when you're concealed in shadow. This is matched with a spread of audio-visual tricks that fill in for Garrett's instincts. Guards have multiple levels of awareness, and if someone catches sight of you the first you'll know of it is a stirring on the soundtrack that conveys the sense that you're being watched. In combat, your vision narrows; when sprinting the world seems to contract around your point

of focus, tilting as you bank around corners and attempt to break line of sight.

When it all comes together *Thief* feels dextrous, physical and fluid to play. Many interactions are context sensitive – jumping and climbing in particular – and where problems emerge it's because Garrett doesn't do quite what you expect. Sometimes you'll peek around a corner when you intended to steal something from the top of a table, and sometimes you'll jump to your death when you thought you were facing a gap you could easily cross. These are issues, but eventually you learn to look before you leap.

The cost of this tactile traversal is that the freedom of movement provided by Garrett's gadgets has been curtailed. Rope arrows only lodge into pre-



Earn skill points by having tea with old ladies.



A small supporting cast provides side missions.



Clockwork puzzles are a hazard of Garrett's job.



Slow down or mess up and you're killed by dogs.

determined points, making them ways of accessing pre-designed hidden routes rather than a means to create your own. Water arrows serve their purpose, but the presence of electric lights in many buildings – deactivated by switches that can be hit with regular arrows – renders them situational. Moss arrows are gone, and a variety of lethal options went unused as the game (happily) didn't require me to kill anybody.

Focus is an upgradable vision mode that makes use of Garrett's enhanced eye. I normally hate magic vision in stealth games, but in *Thief* it's a little better than usual. By default you can use it to detect interactive items, and by investing skill points you can add functions such as slowing time, perceiving the inside of locks, or unlocking the ability to stun alert guards with a blackjack blow to the chest.

The City plays the role of mission hub, not only linking chapters but offering a range

of activities of its own. The majority of side missions are single-room stealth or puzzle challenges, but half a dozen take place in new areas – small but open-ended environments that suit *Thief's* tight take on stealth.

Any mission can be replayed at any time if you wish to go back and try for a better rating. There's also a challenge mode, accessed from the main menu, that enables you to make timed runs on reworked versions of certain mission areas. Factor in secret areas and special loot, and *Thief* has good mileage beyond its initial running time.

LOOTED

A warning for long-time fans: this is a reboot. The old factions are gone and Garrett's backstory has been entirely discarded. Key motifs return, but the result is incoherent. Entire plot threads go nowhere and the whole lot feels cobbled together despite some adept moments that crop up.

Thief's previous selves surface from time to time as ugly reminders of the game that almost was, and the campaign is deeply inconsistent as a result. The missions that focus around actual thieving are strong. Elsewhere, not so much. You'll dodge bits of an exploding building and attempt to evade alert guards in a boxed-in area right out of *Batman: Arkham Asylum*. You'll explore a haunted mental asylum that has none of the terrible brilliance of *Deadly Shadows'* haunted orphanage. There are a couple of boss encounters – better than *Deus Ex: Human Revolution*, but, yeah. Boss encounters.

Certain areas are linked by brief third-person climbing sequences straight out of *Assassin's Creed*. Then there's a chase sequence that gets *Thief* about as wrong as is possible – you dash across rooftops and steer Garrett into cinematic scrape after cinematic scrape. Screw up

and you're killed by dogs.

The team at Eidos clearly know a lot about interaction design, and enough about level construction to build exciting places to plunder, but I wish this competence had been matched to a more coherent vision.

Thief – the series – has been many things, but it has always been important. It might be unfair to expect a reboot to capture that catalytic fire, but I think it's flat-out unrealistic too. This is a decent stealth game that's nice to play, which will be enough for many, and if you feared the worst, you can rest a little easier. But the thing about evading disaster is that sometimes greatness slips away too.

■ Chris Thursten

Verdict

Great in places, but never lives up to its potential. A competent series reboot let down by inconsistency.





Paper Sorcerer

A turn-based RPG that's far from flimsy.

US\$4.99 | PC | WWW.ULTRARUNAWAY.COM/

Paper Sorcerer is a traditional dungeon-crawler spiced up by first-person adventure. Each level is unique, and although limited in decoration the game's basic puzzle-solving stops them feeling too monotonous. The paper world is a pleasure to explore, but with no map you quickly get lost. Be prepared to retrace your steps several times, and God help you in a random encounter zone. You'll be there for a while.

Paper's turn-based combat is the most rewarding part of the game, prioritising tactics over spamming moves. Make sure you've balanced your party, or things can get ugly. Abilities unlock automatically as you level up, transforming you from bedraggled loser to fire-conjuring maniac. A lot of calculations happen behind the scenes, but don't clutter up the screen. The same cannot be said of the combat menus, which can be a pain to scroll through. The battles sometimes feel sluggish, especially in areas where there's not enough exploration to balance it all out.

Paper overcomes these minor quibbles because it's just good fun. Each victory feels like you have actually achieved something. Each defeat is frustrating but you're compelled to give it another try. The story charges forward with enough humour and mystery to keep you entertained. Even with the odd glitch and typo, *Paper Sorcerer* is more than worth its price. ■



\$21.95 | PS3 | AU.PLAYSTATION.COM/STORE

The Last of Us: Left Behind

Modern classic loses nothing in switch to Ellie vision.

This DLC review absolutely has to be prefaced with a 'Don't touch until you've completed the main game' disclaimer. Not only will the events of *Naughty Dog's* newest creation go way over your head, pretty much all of the emotional beats will totally miss their mark as well.

The excellent news as far as *Left Behind* is concerned is that it's every bit as accomplished, engaging and lovingly crafted as the main game. The bad news is two-fold: it's fairly short, and — especially given the length — pretty expensive, coming in at \$22 for just over two hours of play. But we can recommend it without hesitation regardless, and crucially this feels like a piece of content that was always planned to be a part of the *TLOU* narrative, rather than something that's been shoehorned in just to meet Season Pass obligations.

A large part of the joy of *Left Behind* comes from the narrative specifics, so we'll steer clear of spoilers and just say this: it takes place partially during the main game's timeline, and

partially prior, with Ellie exploring the quarantine zone with her friend Riley.

The two sections are diametrically opposed in terms of how they play: the 'now' portions are action and stealth heavy, as you guide Ellie around a ruined shopping mall looking for supplies. Here you'll run into a number of infected (mainly the dreaded Clickers), and, later on, a fairly hefty amount of murderous survivalists up to no good.

Naughty Dog has done a fine job of reintroducing you to the basics of combat tactics and controls, but there are some tough sections where you'll do well to keep Ellie's neck intact. Anyone who hasn't played the main game will be utterly at sea with how to go about clearing rooms and using the various tools at your disposal but, again: this is not for you.

The flashback portion is a totally different beast, featuring almost no combat at all, but rather simple, wide-eyed exploration and discovery. Here we get to see how Ellie was in the pre-Joel era, and a far less cynical and jaded side of her personality.

It's touching, tender, well-handled, and revelatory, plus a show of confidence from the developer to trust that you're sufficiently invested in the characters to not be constantly itching for something to shoot at.

One possible criticism of this part of the tale is that it falls back on something Naughty Dog has traditionally avoided, in relying largely on cutscenes for narrative exposition. They're obviously well-made and don't hamper your enjoyment of what's playing out — and given the DLC's short running time are perhaps necessary — but it's a noticeable shift for the developer nevertheless.

The crucial thing is that the entire package absolutely holds up in quality terms when compared to the main game. It looks beautiful, the dialogue is accomplished, and it's undeniably emotive, no matter how hardened your heart. ■

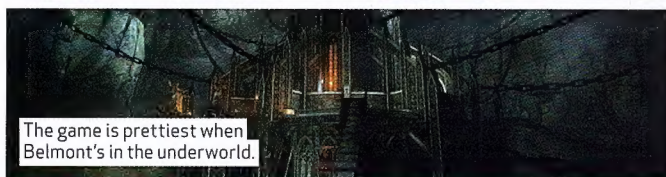
Verdict

A fantastic way to extend an already brilliant narrative, and made with a hugely engaging structure.





QTEs abound. There are doors that take five of the things to open.



The game is prettiest when Belmont's in the underworld.



Launch foes into the air to break their attacks.

\$69.95 | PC, PS3, XBOX360 | WWW.KONAMI-CASTLEVANIA.COM

Castlevania: Lords of Shadow 2

A mess of flawed systems that manages to make playing Dracula boring.

My name is Gabriel Belmont, the latest in a long line of renowned vampire hunters. At the end of *Castlevania: Lords of Shadow*, things went a bit south, and I became Dracula. At the outset of this sequel I awake from a thousand-year slumber in a future-gothic London, stripped of most of my powers — but within a couple of hours of play I'm back up to full strength. I am the Prince of Darkness, so why am I spending so much of my time cowering in it, disguised as a rat?

As a concept, *Lords of Shadow 2* is full of potential. MercurySteam spends most of its 20-hour runtime squandering the lot.

Take the interminable stealth sections, the chief mechanical addition to the first game's blend of linear platforming and third-person melee combat. Belmont spends a lot of the first hours of the game, and far too much of the rest of it, sneaking through the headquarters of an evil pharmaceutical company evading armoured demonic

guards. His magical powers are disabled except for the ability to transform into a rat and sneak through small spaces. He can follow a ventilation network into an adjacent room, or chew on cables to cut the power.

The game's stealth element is profoundly linear, leaving no room for experimentation. It's miserable stuff that reaches its nadir two thirds of the way through — this is when you have to traverse a garden in the underworld while evading a goat-headed pursuer who'll insta-kill if he catches you.

The potential of the setting is similarly wasted. Too much of the action is set in drab medical facilities, sewer networks and tower blocks. One section took me to an underground car park, then an elevator leading to a cutscene, then back in the lift and down to the car park for a fight, followed by a basic environmental puzzle, and another elevator. I'm Dracula. Can I not just turn into a swarm of bats and fly in through the window?

Combat involves switching from Belmont's signature whip to Dracula's famous

health-recharging Void Sword and heavy-hitting Chaos Claws — just as Bram Stoker wrote it.

Use of the latter is regulated by a pair of magic meters recharged in combat by filling a combo bar that empties as soon as you take a hit. Which you will, thanks to the wayward camera that makes it next to impossible to track where the next attack is coming from. And while a well-timed press of the block button will parry an attack, unblockables must be dodged.

It's baffling that a developer who garnered such acclaim for its successful 3D reinvention of a long-running series could not only fail to improve on its formula with the sequel, but make a game that's distinctly worse in almost every possible way. Who ever thought playing as Dracula would be so thoroughly dull? I sure didn't.

■ Nathan Brown

Verdict

A miserable blend of flawed game mechanics that's a giant leap backwards from its predecessor.



Saturday Morning RPG

Taking a trip down memory lane.

US\$6.99 | PC | STORE. STEAMPOWERED.COM

Snap bracelets and Art Attack and Pogs and Danger Mouse! Nostalgic name-dropping is fraught with danger. Go niche and it's exclusionary. Go broad and it's Meet the Spartans. Thankfully, *Saturday Morning RPG* walks the line with deftness, a game forged on the cultural touchstones of the '80s and '90s.

You play Marty Hall, a school kid who earns the ire of the evil Commander Hood when he discovers how to channel magic through everyday objects. Objects like a Trapper Keeper notebook in which you can store scratch 'n' sniff stickers that, before battle, are rubbed to activate attack buffs or enemy handicaps.

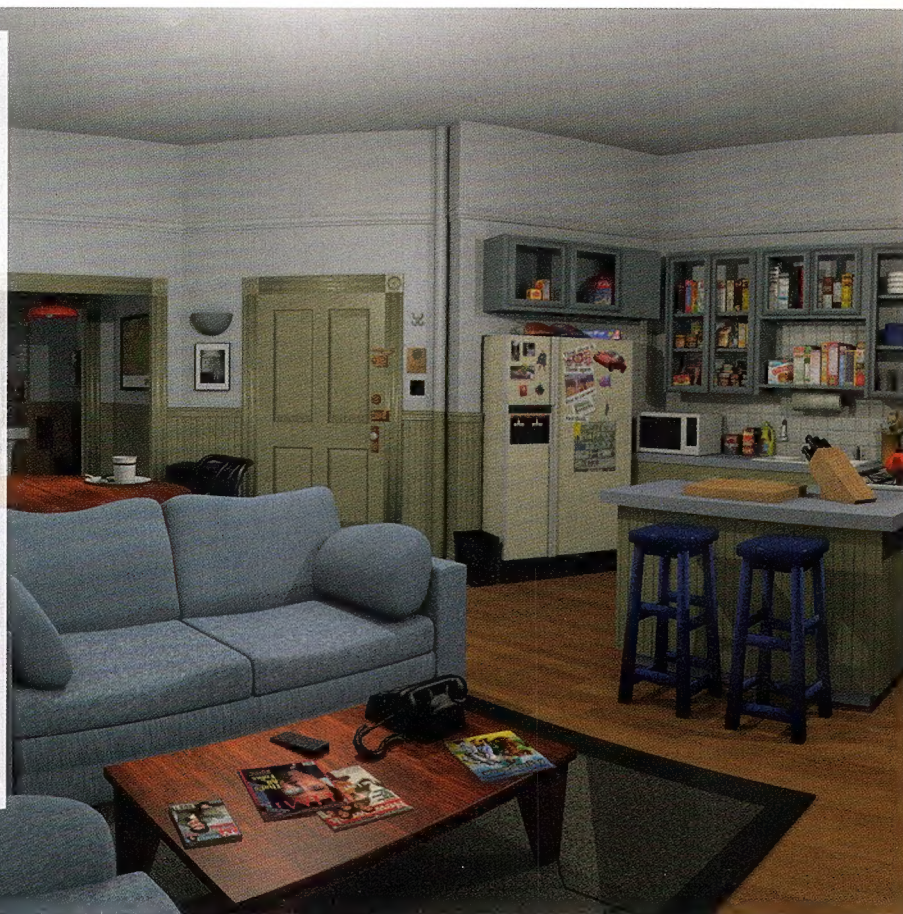
Battles are *SMR*'s best bit. They're actively turn-based, meaning that to defend, for instance, you'll press 'V' just before a blow lands. To boost your rhinestone-gloved Michael Jackson backslaps, you'll charge up an AA battery by stopping a dial on a power gauge. This tactical layer is invaluable, because *SMR* isn't the most complex game.

Environments are simple, and due to the lack of combat moves, sequences repeat — burn, paralyse, then unleash a rainbow zebra stampede. But it hardly seems to matter amid the references to *The Breakfast Club*, *Back To The Future* and *Transformers*. This is a love letter first and an RPG second.

Four short episodes and the promise of a free fifth are your lot. A bit meagre, perhaps, but for less than \$10 this is a nostalgia trip worth taking — a short, simple RPG that's a neat pop culture homage. ■

Sein of the times

Virtual reality hit the headlines in the '90s, with the world's technologists at the time pointing to some clunky polygon games and telling us that *this was going to change everything*. They were right, of course; it just took a couple more decades for the concept to evolve and show up in a significantly polished form. The latest evidence: a *Seinfeld* fan has lovingly made a full 3D model of the interior of Jerry's apartment from the TV show, which owners of the Oculus Rift headset can freely download and virtually wander about within. Of course, the place might seem a little lonely without the possibility of bumping into George, Elaine or Kramer, but hey — if you ever wanted to pretend that you were Jerry Seinfeld home alone, this is your dream come true.

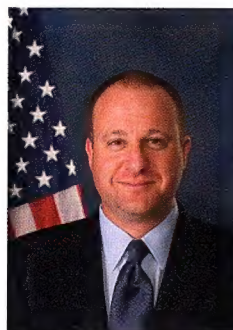


The iPhone that never sleeps

When Apple unveiled the iPhone 5s and showed off its fancy M7 co-processor, we were told the low-power chip would enable all sorts of seamless motion data tracking without draining the device's battery. What we weren't told was we would have a sneaky stowaway on our smartphones, capable of recording our movements even when the device was turned off. Nonetheless a Canadian user, known as Glarznak on Reddit, recently discovered this to be the case after returning from a quick trip to Europe. His iPhone's battery ran out of juice abroad, and without a working charger to revive the device, he simply carried the seemingly dead smartphone with him for the remainder of his journey. On charging the iPhone back at home, Glarznak was "impressed and slightly terrified" to see that one of his fitness tracker apps had still been able to count the steps he'd taken for each day while the phone was turned off. Creepy!



"Just because the battery is flat, doesn't mean it doesn't work."



US Congressman Jared Polis — keep the Bitcoins, limit the dollar bills!

Once Bitcoin, twice shy

The controversy surrounding digital crypto-currency Bitcoin refuses to go away, with some US lawmakers pushing for an outright ban, alluding to its potential misuse for the procurement of illegal goods and services — as notably seen in its high-profile association with black market web site Silk Road, shut down by the FBI late last year. However, Bitcoin's ability to be used to finance dodgy deals hardly makes it unique — every currency known to man can be traded in illegal transactions, as ably pointed out by US Congressman Jared Polis in his witty (and purely satirical) retort to the would-be reformers: "I write today to express my concerns about United States dollar bills. The exchange of dollar bills, including high denomination bills, is currently unregulated and has allowed users to participate in illicit activity, while also being highly subject to forgery, theft, and loss. For the reasons outlined below, I urge regulators to take immediate and appropriate action to limit the use of dollar bills." Zing! ■



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